

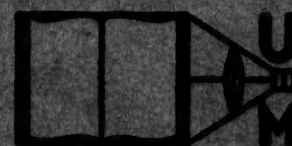
Vol. XV

No. 9

# DISSERTATION ABSTRACTS

*A GUIDE TO DISSERTATIONS AND  
MONOGRAPHS AVAILABLE IN MICROFORM*

UNIVERSITY MICROFILMS  
ANN ARBOR, MICHIGAN: 1955





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## AGRICULTURE

### AGRICULTURE, ANIMAL CULTURE

#### SOME PHYSIOLOGICAL EFFECTS OF FEEDING VARIOUS FILLED MILKS TO DAIRY CALVES

(Publication No. 13,312)

Richard Sanford Adams, Ph.D.  
University of Minnesota, 1955

Adviser: Thor W. Gullickson

Some physiological effects of feeding various filled milks were studied in an attempt to determine the factors responsible for the unsatisfactory gains, poor physical condition and deaths, which other workers have reported as occurring in calves fed liquid rations containing highly unsaturated vegetable fat. The experimental rations used in this study were prepared by homogenizing various fats and oils into skim milk to provide a product containing 3.5 per cent fat. The filled milks, as supplemented with adequate amounts of minerals and vitamins known to be essential, constituted the sole source of nutrients for the calves.

Under the conditions of the experiment, the results of feeding a corn oil filled milk to young dairy calves were, as follows:

- (1) Animals appeared emaciated and unthrifty.
- (2) An increased susceptibility to pneumonia and a high mortality rate occurred when infection was not rigidly controlled.
- (3) Symptoms of anorexia and muscular involvement were observed.
- (4) Poor feed utilization and unsatisfactory weight gains were obtained.
- (5) A marked diarrhea was noted.
- (6) Digestibility of dry matter was significantly reduced.
- (7) A decline in blood plasma tocopherol levels occurred.
- (8) Alterations were observed in the electrocardiograms of some individuals.
- (9) Gross and microscopic lesions were found in cardiac and skeletal muscle.

On the other hand, calves fed hydrogenated corn oil, lard or butter oil filled milk and whole milk were not affected in the above manner, except as follows: animals receiving lard and butter oil, which was prepared from oxidized butter, also exhibited symptoms of muscular involvement and muscular lesions were demonstrated in these groups. Supplementation of the corn oil filled milk diet with an equivalent of 500 grams of alpha tocopherol daily prevented the development of muscular involvement, but did not improve weight gains.

Daily preparation of the corn oil filled milk so as to materially reduce the peroxide content of the diet resulted in an abatement of the diarrhea and an increased dry matter digestibility. Growth, however, was not beneficially affected.

Diets containing as low as 0.1-0.15 per cent butterfat were not detrimental to growth and physical condition of calves under the conditions of the experiment. No evidence of muscular involvement was noted in animals with extremely low blood plasma tocopherol concentrations as the result of being fed a fat-poor, but otherwise adequate diet.

It was found that the apparent metabolic fecal fat excretion by calves fed a skim milk diet containing 0.1 per cent butterfat amounted to 5.36 per cent of the fecal dry matter. Partition of the fecal lipids revealed that a large percentage of the fecal fat was excreted as soaps by animals receiving the various diets.

137 pages. \$1.71. MicA 55-1943

#### MAMMARY GLAND MEASUREMENTS IN CALVES AND THEIR PREDICTION VALUE

(Publication No. 13,315)

Vernon LeRoy Baldwin, Ph.D.  
University of Minnesota, 1955

The mammary glands of 927 calves of 4 breeds from 239 Minnesota D.H.I.A. herds having variable management and nutrition levels were palpated in 1950 and 1951. The purpose was to test, in the field, Swett's method (1947) for predicting future production by udder palpation.

Usable production records were available on 262 Holsteins from 90 herds and 69 sires, and on 105 calves of breeds other than Holsteins from 40 herds and 46 sires.

"Holsteins" and "Breeds Other Than Holsteins" were treated in these 2 groups because of the small numbers in each breed of the latter group.

Analysis of variance and correlation analysis of Holstein data revealed poor predictability of milk or fat production from palpation grade in this study. Average production of the daughters of individual Holstein sires also was not predicted accurately from the average palpation grade.

Six calf management or calf nutrition levels as measured by grades contributed to the correlation coefficients between palpation grade and production and to the variation in these variables.  $r^2$  indicated that 72% of the variation in milk production from one management grade to another, is associated with variation in palpation grades from one management grade to another.

The following adjustments were applied to the principal variates, palpation grade or 2X, 305 day milk or fat production:

- Mature equivalent
- Fat corrected milk
- Palpation grade adjusted to constant age
- Diseased calves removed
- Cows with miscellaneous troubles removed



Grouped in herd butterfat average  
in year of record  
Between and within sires for each  
calf management grade

None of these adjustments materially changed the estimates of relationship between the variates in Holsteins.

Analysis of "Breeds Other Than Holsteins" produced quite different and confused results varying widely from those in "Holsteins." A poor estimation of management levels was indicated. Improper classification of these variations would move some of them to the within sires within management analysis producing the spurious  $r$ 's.

Several discoveries were then made:

1. Removing known diseased calves from this group resulted in higher contribution of management to the  $r$ .
2. Only 30% of the "Breeds Other Than Holstein" were palpated in 1950 with 39% diseased compared to 13% of the 70% palpated in 1951. 86% of the Holsteins were palpated in 1950 with 19% diseased compared to 3% in 1951.
3. Collection of data was done more hurriedly in 1951 than in 1950 because of pressures on the palpator.
4. The farmer was not present as often in 1951, contributing to less recording of disease.
5. Including 4 breeds together resulted in higher  $r$ 's with fat than with milk.

These facts add credence to the hypothesis that disease, breed and year variations contributed to spurious  $r$ 's in "Breeds Other Than Holstein".

Since results in breeds other than Holsteins appear not reliable in this study, conclusions must be drawn from the Holsteins. This study indicates that one cannot, under these varied conditions, predict with accuracy, either the production of individual calves or averages of a sire's daughters from their palpation grades. The method, therefore, is indicated to have little general application value for artificial breeding organizations under conditions in this study.

An interesting possibility developed when the analysis was made between and within Holstein sires for each management grade. Within sires the correlation coefficients increased from one management grade to another ranging from  $-0.03$  to  $+0.29$ . None were significant but this trend indicated that the predictability improved in the higher management grades. If studies with larger numbers in each management grade showed this trend to be real it might help to explain why results in this study differ from those by some other workers.

113 pages. \$1.41. MicA 55-1944

#### THE UTILIZATION OF SMOOTH BROMEGRASS (BROMUS INERMIS) UNDER ROTATIONAL AND STRIP GRAZING SYSTEMS OF PASTURE MANAGEMENT

(Publication No. 13,318)

Arthur Lain Brundage, Ph.D.  
University of Minnesota, 1955

Grazing trials have been conducted at the Alaska Agricultural Experiment Station, Palmer, Alaska, during the grazing seasons of 1953 and 1954 to study the utilization

of smooth brome grass under rotational and strip grazing systems of pasture management. During the 1953 season, four acres of brome grass were equally divided into two portions. One portion was further subdivided into four equal paddocks and grazed under a rotational system of management. The other half was grazed under a strip grazing system of management using temporary electric fences to restrict an area sufficient for one days grazing need. The temporary fences were shifted daily. During the 1954 season, 6.4 acres were divided and managed in the same manner as in 1953. Groups of four milking dairy cows were used as experimental animals for each system.

Pasture production during each season was determined according to the method of Knott, et. al. Production was slightly higher under the strip grazing system for each year studied. Differences were not great, however, and it was concluded that nearly all of the potential production of a brome grass pasture of average quality could be obtained under a good system of rotational grazing.

Nine continuous behavior studies were conducted between morning and evening milking during the first pasture season. Total grazing time was influenced by quality and quantity of available herbage. As the quality decreased with advancing maturity, grazing time increased due to an increase in selective grazing. As quality and quantity declined during subsequent grazing, grazing time increased because of reduced intake per bite in addition to selective grazing due to soiling with dung and urine during previous grazing. The cows under the rotational system of management shifted their period of intense grazing activity to the afternoon when grazing an area which was nearly defoliated.

The combined chromium oxide-chromogen ratio techniques were employed during the second season to study the total dry matter intake and apparent dry matter digestibility of herbage consumed by one cow on each management system. Feces were collected twice daily and composited into consecutive three day samples. Each fecal sample contained two days feces in common with the samples immediately preceding and following it and one days feces in common with the samples immediately preceding and following those. From these samples it was possible to estimate the daily fluctuations in digestibility and fecal output without sacrificing any of the accuracy of three day composite samples.

Multiple correlation analyses were computed with the data from these two animals, using time, digestibility, fecal output, total intake, daily weight, and daily four per cent fat corrected milk production as variables. It was concluded from these data that fecal output and milk production resulting from ingestion of pasture herbage occurred maximally the same day. The simple correlations between time and milk production were highly negatively significant for both cows. None of the partial correlations of the other variables with milk production independent of time were significant for the cow under the rotational system. The partial correlation between digestibility and milk production independent of time was highly significant ( $+0.3977$ ) for the cow under the strip grazing system.

Clippings were taken prior to entry on each paddock and related strip grazed area during the 1954 season. Yields estimated from clippings, from the digestibility-intake studies, and from calculated T.D.N. requirements were all significantly correlated with each other and were all valid estimates of herbage utilization.

98 pages. \$1.23. MicA 55-1945

AGRICULTURE, FORESTRY AND WILDLIFE

A STUDY OF SOME ASPECTS OF SUSCEPTIBILITY  
OF PONDEROSA PINE TO ATTACK  
BY BLACK HILLS BEETLE

(Publication No. 12,625)

Edwin Walfred Mogren, Ph.D.  
University of Michigan, 1955

Two problems are explored in this study: the first, an examination of ponderosa pine's susceptibility to attack by the Black Hills beetle; the second, an evaluation of pine's resistance to the beetle subsequent to its attack.

The observational design was based on both paired plots and paired trees. The standard error of the difference for paired data, and chi square were used to evaluate differences which resulted when infested and uninfested trees were compared.

Based on an analysis of differences in conditions and characteristics of infested and uninfested trees the following conclusions were reached concerning susceptibility of ponderosa pine to attack by the Black Hills beetle.

1. A difference does exist in susceptibility among ponderosa pine to Black Hills beetle attack under both endemic and epidemic levels of infestation.

2. Susceptibility of pine to beetle attack is a function of a tree's existing vigor. The more vigorous a tree is the less susceptible it is to beetle attack.

3. Vigor requirements associated with pine's susceptibility vary with the level of the beetle population.

4. Black Hills beetles, upon leaving the brood tree, do not fly great distances, but attack nearby susceptible pine.

5. A tree that has sustained current barking damage which is growing in an area of low beetle population is more subject to beetle attack than an unbarked tree.

6. Paired trees is the preferred sampling unit in the design of the experiment.

7. The differences that were found to exist between susceptible and less susceptible trees were of such a magnitude that they were not readily discernible in the field, but became evident only through a careful sampling procedure.

An analysis of the differences between resistant and non-resistant ponderosa pine constitutes the second portion of the study. Based on this analysis of tree conditions and characteristics the following conclusions were reached concerning resistance of ponderosa pine to attack by the Black Hills beetle.

1. There are ponderosa pine that are truly resistant to Black Hills beetle attack.

2. Resistance in ponderosa pine is a reflection of good vigor or health.

3. The occurrence of resistance in ponderosa pine can be traced back to earlier establishment in a group. By gaining a time advantage on its associates, the resistant ponderosa pine achieves dominance early in its life, and if growing conditions are good is able to broaden the difference in size and vigor which occurs between it and other trees in the group. Consequently, resistant trees are the largest, have the best crown development, and occupy the best position in the forest canopy.

4. Resistant trees appear to have a greater number of resin ducts with which to move resin and "pitch out" the attacking beetles.

5. The number of resistant trees is relatively small. Only about five per cent of trees attacked by the beetle are able to successfully resist attack.

111 pages. \$1.39. MicA 55-1946

AGRICULTURE, PLANT CULTURE

SOME CHEMICAL ASPECTS OF THE CONTROL OF  
MAGNESIUM DEFICIENCY IN CELERY GROWN ON  
THE ORGANIC SOILS OF MICHIGAN

(Publication No. 12,951)

Keethley Eustace E. Johnson, Ph.D.  
Michigan State University, 1955

This work was initiated to study several factors that may affect the chemical and physiological relationships associated with the occurrence of magnesium deficiency of celery grown on organic soil.

Experiments were conducted in the greenhouse, in the field and in the laboratory. Twenty-one varieties of celery including thirteen pascal and eight yellow types were grown. Utah 10B, susceptible to magnesium deficiency, was the variety most widely used.

The field experiments were conducted in several of the celery producing areas of the state including Allegan, Clinton, Kalamazoo, Lapeer, Muskegon, and Ottawa counties.

The soil treatments included different levels of magnesium, calcium, potassium and sodium. Rates and methods of application of several magnesium carriers, either to the soil or as a foliar spray, were also studied.

Analyses were made for magnesium, calcium, potassium and sodium in plants and soil by use of a Beckman DU Flame Spectrophotometer equipped with a photomultiplier. Analyses for phosphorus, boron, copper, iron and manganese were made by use of a Jarrell-Ash spectograph, except for available phosphorus in soils which was determined colorimetrically. Additional analyses on the soils included exchange capacity, exchangeable bases, percent base saturation, exchangeable hydrogen, pH, organic matter and total ash.

Evidence obtained indicated that magnesium deficiency in celery occurs in a wide range of soil conditions. Control of magnesium deficiency, in Utah 10B celery, by soil application was obtained for the first time in Michigan, by a rate of two to four tons of magnesium sulfate, applied broadcast one week after transplanting. Most efficient control was accomplished by seven pounds of magnesium sulfate in 100-150 gallons of water applied as a foliar spray to an acre of the crop at weekly intervals throughout the growing season, starting four weeks after transplanting. Other magnesium carriers used for control of magnesium deficiency were the chloride, the acetate and a commercial chelate called "Sequestrene" for which methods and rates of application are presented.

No yield increase was obtained from magnesium at any rate or method of application, but it was possible to improve the yield quality. It was possible to adversely affect yields by some rates and methods of magnesium application.



Increase in the percent magnesium in the plant, although not always indicative of disappearance of symptoms, was effected by both soil and foliar applications of magnesium with the latter contributing to the larger increase. Different varieties exhibited different abilities to utilize magnesium from the soil as well as from foliar applications.

It was established that for mature susceptible varieties 0.0700.128 percent magnesium of the above-ground portion was indicative of magnesium deficiency symptoms and when this was raised to 0.144 percent or above, no symptoms developed.

Variations in magnesium content of the same variety grown at different locations could be correlated positively with the percentage magnesium saturation of the soil (0-6 inch depth) exchange complex, and negatively with the calcium to magnesium ratio. This variation was also influenced by the presence and availability of other cations in the surface and subsurface soil.

There was no consistent influence of magnesium applications to the soil or as a spray, on the uptake of other nutrients, except that in many cases it reduced calcium and increased potassium concentrations in the plant.

The composition of leaves and the entire above-ground portion of the plant were better than the upper petiole and the lower petiole for correlation of soil composition variation, nutrient application, and occurrence of magnesium deficiency symptoms.

Analysis of leaf blades and blade sections, separated as to the occurrence of chlorosis, showed that the magnesium, manganese, phosphorus and potassium contents were higher and calcium, sodium and copper contents lower in the normal tissues, with no difference in either the iron and boron contents.

Instrumental conditions and techniques for eliminating interference in the operation of the Beckman DU Flame Spectrophotometer equipped with a photomultiplier are suggested.

96 pages. \$1.20. MicA 55-1947

#### INHERITANCE OF FERTILITY RESTORATION IN CYTOPLASMIC MALE-STERILE ZEA MAYS

(Publication No. 13,340)

Owen Jay Newlin, Ph.D.  
University of Minnesota, 1955

The discovery of certain sources of cytoplasmic male-sterility in corn and their successful incorporation into inbred lines have brought about the reduction and possible elimination of detasseling in the production of hybrid seed corn. Two procedures are being employed to provide ample pollen in the final crop grown for grain. One method

is the mixing or blending of seed produced on normal single crosses with seed produced on male-sterile single crosses. A second method involves the use of pollinator single crosses made up of inbreds carrying genes capable of restoring pollen fertility to the male-sterile crosses. The efficient planning of breeding programs to incorporate fertility restoration into inbreds requires knowledge as to its inheritance.

The inheritance of fertility restoration to the Texas and U.S.D.A. sources of cytoplasmic male-sterility was studied in B8<sup>T</sup> and A158<sup>S</sup> testcross progenies of individual plants of A293, A73, (A293 x A73)-F<sub>1</sub>, both backcrosses, and the F<sub>2</sub>. Inbred A293 restored complete fertility in testcross progenies with B8<sup>T</sup>, and B8<sup>T</sup> testcross progenies of inbred A73 were completely sterile. A158<sup>S</sup> testcross progenies of inbred A293 and inbred A73 were neither completely sterile nor completely fertile.

The genetical analysis of data from the B8<sup>T</sup> testcross progenies of individual (A293 x A73)-F<sub>1</sub>, B<sub>1</sub>, B<sub>2</sub>, and F<sub>2</sub> plants in this study indicated that the fertility restoration of A293 to the Texas source of cytoplasmic male-sterility was controlled by a single dominant gene. Two other workers have reported that two dominant complementary genes are necessary to restore pollen fertility in crosses with WF9<sup>T</sup>. These results can be reconciled with results from the present investigation by assuming different genotypes for the male-sterile inbreds B8<sup>T</sup> and WF9<sup>T</sup>. On the premise that the genotype of B8<sup>T</sup> is rrPP and WF9<sup>T</sup> is rrpp, segregation for only one factor could result from B8<sup>T</sup> testcrosses, but segregation for two complementary factors could occur in WF9<sup>T</sup> testcrosses. Therefore, the genotype of inbred A293 is apparently RRPP. Further studies are contemplated to confirm assumed genotypes with respect to the factors controlling fertility restoration to the Texas source of cytoplasmic male-sterility.

Segregation for male-sterility in A158<sup>S</sup> testcross progenies of individual (A293 x A73)-F<sub>1</sub>, B<sub>1</sub>, B<sub>2</sub>, and F<sub>2</sub> plants did not give recognizable genetic ratios. The contributions of A293, A73, and A158<sup>S</sup> were discussed in relation to their possible role in producing the variable frequencies of male-sterile and male-fertile plants. The expression of sterility in the A158<sup>S</sup> testcrosses was apparently influenced by environment. Part of the variability in the expression of male-sterility in the A158<sup>S</sup> testcrosses was attributed to the influence of modifier genes which may vary in their effect on fertility restoration under different environmental conditions.

A comparison between A158<sup>S</sup> and B8<sup>T</sup> testcross progenies of the same plants did not reveal any consistent relationships in the segregations for male-sterility of the paired progenies. The comparisons of the paired progenies indicated that the gene or genes from A293 which restored fertility in crosses with B8<sup>T</sup> are not the same genes carried by certain A73 plants which restored partial-fertility in crosses with A158<sup>S</sup>.

85 pages. \$1.06. MicA 55-1948

## ANATOMY

### THE CYTOLOGY OF THE PARATHYROID GLANDS OF THE RAT AFTER BILATERAL NEPHRECTOMY, ADMINISTRATION OF PARATHYROID HORMONE AND HYPOPHYSECTOMY

(Publication No. 12,667)

Richard Jordan Weymouth, Ph.D.  
University of Michigan, 1955

The parathyroid glands of the rat were studied, after experimentally stimulating and inhibiting their secretory activity, in a search for cytological modifications which might be employed in evaluating the functional state of the glandular cells. The investigation was designed primarily to clarify the possibility that the intracellular argyrophilic granules stained by the Bodian ('36) protargol technique represent stored parathyroid hormone. Cytoplasmic basophilia and phospholipid were studied also. Lastly, the parathyroids were observed after hypophysectomy, in a search for additional information pertaining to the possible existence of direct pituitary control over the parathyroid glands.

Stimulation of the secretory activity of the parathyroids was induced by bilateral nephrectomy in adult male rats. Inhibition of secretory activity was induced by injecting parathyroid hormone. Hypophysectomy was performed by the parapharyngeal approach. The glands were fixed in either a solution of formaldehyde-alcohol-acetic acid (FAA) or in a formol-calcium. Some sections fixed in FAA were stained according to the Bodian ('36) protargol method for argyrophilia and others, with methylene blue or toluidine blue for basophilia. In order to show that the cytoplasmic basophilia was due to the presence of ribonucleic acid, a few sections were digested in a 0.01% solution of ribonuclease, before staining with methylene blue. Also ribonuclease digestion was employed prior to staining with the Bodian technique in order to determine the possible ribonucleic acid content of the argyrophilic granules. The glands fixed in formol-calcium were stained according to the Baker ('46) technique for phospholipid.

Following stimulation by nephrectomy, practically all of the parenchymal cells retained large numbers of

smaller argyrophilic granules, although the larger black ones were depleted. That the argyrophilia was not dependent on the presence of ribonucleic acid was shown by the similar staining capacity of the granules in sections which were digested in ribonuclease and in buffer without ribonuclease. Nephrectomy induced the appearance of large argyrophilic bodies in the connective tissue, especially in the vicinity of blood vessels. Cytoplasmic basophilia, which was shown by ribonuclease digestion to be dependent on the presence of ribonucleic acid, was increased. Bodies stained by the technique for phospholipid, which appeared to be mitochondria, exhibited increased size and staining intensity. They were more frequently arranged in clusters.

After inhibiting the secretory activity of the parathyroid glands by administering parathyroid hormone, a marked increase in the concentration of intracellular argyrophilic granules occurred. Silver-stained granules were not observed in the connective tissue. The cytoplasmic basophilia was decreased in amount and staining intensity. The mitochondria were moderately decreased in number, and a reduction in cellular size followed the administration of parathyroid hormone.

The evidence in this investigation did not support completely the theory that the argyrophilic granules represent stored parathyroid hormone. If this were true, one would expect a significant degranulation following stimulation of the secretory activity of the gland. This did not occur, except for the larger black granules. When the secretory activity of the parathyroid gland was inhibited by the administration of parathyroid hormone, one would expect an increase in the number of argyrophilic granules. This did occur under certain conditions of treatment. The changes which occurred in the intensity of cytoplasmic basophilia due to the presence of ribonucleic acid and in the number of mitochondria could be correlated directly with the presumed state of secretory activity in the gland.

The alterations elicited by hypophysectomy were exceedingly variable in degree and regularity of appearance. Therefore, it is believed that these observations do not support the hypothesis that the pituitary gland secretes a parathyrotropic hormone.

50 pages. \$1.00. MicA 55-1949

## ANTHROPOLOGY

### THE ETHNOHISTORY OF NOOTKA SOUND, VANCOUVER ISLAND

(Publication No. 12,999)

John Edwin Mills, Ph.D.  
University of Washington, 1955

This study is an analysis of historical records made at Nootka Sound, Vancouver Island, during the late eighteenth and early nineteenth centuries and of ethnographic data collected in the same region in 1951.

The analysis revealed the character of the changes in material and social culture; the identification and function of cultural traits once present but now missing in contemporary Moachat society; and the distorted or fragmentary descriptions in the historical records.

Moachat informants could no longer describe many elements of cultural complexes and institutions that disintegrated or were submerged as a result of the dynamics of Caucasian integration. The study also revealed weaknesses in certain descriptive material found in the historical records. Religion, political organization, birth, puberty,



marriage, and death customs are either missing in the literature or are presented in distorted appearance. Three factors, language barrier, non-participation in certain aspects of native life, and the short stay of contact personnel in native villages, caused the near hiatus in the contact literature of descriptions pertaining to covert patterns of culture and non-observable phenomena.

The two major sources, ethnographic and historical,

examined in the study, identically described certain traits associated with hunting and fishing techniques, war, house and canoe construction, trade and war. However, with each of the items described, one source would generally complement the other.

The study has concretely demonstrated the use and value of historical documents in the reconstruction of an aboriginal culture. 179 pages. \$2.24. MicA 55-1950

## BACTERIOLOGY

## FACTORS AFFECTING THE PROPAGATION OF RABIES VIRUS IN TISSUE CULTURE

(Publication No. 12,588)

Robert James Hosley, Ph.D.  
University of Michigan, 1955

The present study has attempted to elucidate some factors which may be operative in tissue culture systems employed for the propagation of neurotropic viruses. The virus of rabies was chosen both for its neurotropic properties and because of an interest in this virus stimulated by the lack of critical studies on factors affecting its propagation in tissue culture. The principal aim of the investigation was to indicate general areas where either physical or biochemical influences appear to exert effects of sufficient magnitude to warrant additional observations by more exacting methods, or serious consideration in the modification and improvement of methods currently employed for the commercial production of virus in tissue culture where optimum yields are desired. Secondly, it was hoped that some information might be obtained which would ultimately contribute to our understanding of the phenomenon of virus neurotropism, and possibly also have application to the prevention or treatment of the specific disease entity caused by the virus under study.

The virus was propagated in a simple balanced salt solution containing glucose and minced brain from 1 to 3 day old mice. The medium was modified by the inclusion of various compounds under study. Virus titers were obtained for the culture flask contents at zero hours and again at 72 hours following incubation. Final titers of experimental and control cultures were compared to ascertain the magnitude and direction of the effect of various compounds or experimental conditions on virus propagation. The results and conclusions of this study are summarized below.

Virus titers of approximately 6 logs were obtained when minced brain from 1 to 3 day old mice was suspended in a simple balanced salt solution containing glucose but without added serum or ultrafiltrate. The virus could not be propagated in adult tissue. Optimum yields were obtained after 96 hours incubation at 37C. When virus is propagated in a tissue mince, the pH of the medium must be adjusted to a relatively high level (pH 8 in the present instance) and maintained within a narrow range for optimum yields.

Intrinsic factors did not suffice for the production of virus without the addition of an energy source such as glucose. A relatively slow rate of tissue respiration appeared

to be favorable for virus propagation. Compounds added to the medium which stimulated tissue respiration resulted in low virus titers. Compounds or conditions which caused a depression of tissue respiration (malonate, hypotonic or hypertonic medium) enhanced virus propagation. It is probable that the rate of tissue respiration is correlated with the activity of energy transformation systems operating in competition with the virus production system. The presence of acetyl choline in the medium enhanced propagation presumably through phenomena associated with cell permeability.

The synthesis of rabies virus in host tissue appears to be intimately associated with tyrosine metabolism. Low concentrations of L-tyrosine added to the medium enhanced virus propagation without evidence of an effect on tissue metabolism. Phenyl serine was found to be effective in blocking tyrosine metabolism *in vitro*. Low concentrations of this compound added to the medium inhibited virus propagation without evidence of an effect on tissue metabolism. When mice received an intracerebral challenge of approximately 2 LD<sub>50</sub> of rabies virus and were fed a ground diet containing 2 per cent phenyl serine, fewer mice succumbed to rabies infection in the treated than in the control group. The difference between these groups was not a statistically significant one in the small sample of mice employed.

74 pages. \$1.00. MicA 55-1951

IDENTIFICATION AND ORIGIN OF A MALTY AROMA SUBSTANCE PRODUCED IN MILK BY STREPTOCOCCUS LACTIS VAR. MALTIGENES

(Publication No. 12,726)

Harold Woodworth Jackson, Ph.D.  
The University of Connecticut, 1955

The organism S. lactis var. maltigenes produces a characteristic aroma in dairy products. This undesirable aroma has often been described as "malty," "caramel" or "burnt." The bacterial fermentation responsible for this aroma is one about which little is known.

The purpose of this investigation was to attempt the isolation, identification and determination of the origin of the compound or compounds responsible for the typical malty aroma produced by S. lactis var. maltigenes.

The aroma substance was removed from milk cultures by steam distillation and separated as a

2,4-dinitrophenylhydrazone derivative by paper chromatography. Chromatographic analysis indicated that *S. lactis* var. *maltigenes* produced a pentanal fraction that was not present in milk cultures of *S. lactis*. Micro-melting point data and infrared analysis indicated that the pentanal fraction consisted largely of 3-methylbutanal with a small amount of 2-methylbutanal. Addition of 3-methylbutanal to fresh pasteurized milk imparted a characteristic malty aroma at a concentration of 0.5 ppm.

Suspensions of washed *S. lactis* var. *maltigenes* cells were incubated with L leucine at pH 7.0 for 2 hours at 37°C. and the carbonyl compounds formed were extracted as 2,4-dinitrophenylhydrazones. The principal derivative isolated by the paper chromatographic procedure was that of a pentanal having the same melting point as known 3-methylbutanal derivative.

The organism also was shown to be capable of converting isoleucine to a pentanal which was presumed to be 2-methylbutanal. This reaction however, appeared to be much slower than that with leucine as substrate. *S. lactis* cells were unable to convert these amino acids to the corresponding pentanals.

Speculation as to the mode of formation of pentanals from leucine and isoleucine would seemingly involve a deamination and decarboxylation of these amino acids by *S. lactis* var. *maltigenes*.

37 pages. \$1.00. MicA 55-1952

#### A COMPARATIVE STUDY OF THE VIABILITY OF BACTERIAL AEROSOLS

(Publication No. 13,049)

John Pushegy Thomas, Ph.D.  
Lehigh University, 1955

This investigation was undertaken in order to determine the quantitative effect of various temperatures on the biological stability of bacterial aerosols in a controlled environment at a relative humidity approaching the water saturated level.

Accordingly, experimental apparatus was designed and constructed to provide a controlled environment for the test aerosol populations. The chamber was constructed of "Lucite" and is essentially a vertical cylinder six feet high with an internal diameter of five and one-quarter inches. The effective capacity of the chamber is determined by a consideration of two factors: (1) the maximum volume of aerosol which can be sampled, this being equivalent to 14,500 cc. and is a factor fixed by physical dimensions,

and (2) the maximum length of time during which samples may be taken. The time factor is variable and is a function of the radius and the geometrical configuration of the organism *per se*. In brief, experiments were performed by (1) bringing the relative humidity to the water saturated levels by circulating air over water contained in the chamber reservoir, (2) establishing the temperature desired by circulating water from a constant temperature water bath through the copper coils jacketing the chamber by means of a small centrifugal pump, (3) establishing a relatively homogeneous aerosol population by mixing the aerosol produced as a result of filtered air under pressure passing through three DeVilbiss No. 44 nebulizers, and (4) sealing off the environment and taking replicate population samples at fixed time intervals. The number of replicates and the sampling interval is determined for the most part by the biological aerosol stability of a given organism at a given temperature. Sampling is achieved by the withdrawal of a 90 ml sample as measured by a hypodermic syringe and discharging it into a Casella slit sampler which causes the particles to impinge upon a rotating culture plate within the sampler. Mean replicate plate counts after incubation indicate the amount of population loss with time.

Preliminary experimentations were conducted to ascertain the forces and factors which could conceivably operate in this system to cause significantly variable losses in the physical and viable aerosol population and further to determine errors evolving from technic, counting, and colony confluence. Investigations were then conducted with stock cultures of thrice-washed cells grown on a standardized medium from the progeny of a single colony and harvested during the logarithmic growth phase.

Conclusions, expressed in terms of per cent population loss per minute (L), based upon a total of 84 experiments and 2,375 samples show:

(1) the depletion in the physical numbers (Stokes-Law settling) of a test aerosol population, as determined by the use of *Bacillus subtilis* (globogii) spores, is small (L = 0.4), (2) at any given experimental temperature, *Serratia marcescens* Camp Detrick Webb strain exhibits the least biological stability, and the effect of increasing the experimental temperature from 16°C to 43°C is to increase the biological death rate approximately tenfold (L of 2.3 to 21.5), (3) the effect of increasing the experimental temperature with aerosols of *Escherichia coli* Camp Detrick strain No. 17 is also marked and shows an approximate fivefold increase in the biological death rate (L of 1.5 to 6.4), and (5) on a comparative basis, experimental temperature effects on aerosols of *Micrococcus pyogenes* var. *aureus* Lehigh strain No. 84L are negligible (L of 1.1 to 1.2).

130 pages. \$1.63. MicA 55-1953



## BIOGRAPHY

### AHMAD AMĪN AND LAJNAT AL-TA'LĪF WA AL-TARJAMAH WA AL-NASHR: A Study of Their Contribution to the Twentieth Century Renaissance of Egypt

(Publication No. 13,052)

Kenneth Laverne Crose, Ph.D.  
The Hartford Seminary Foundation, 1955

Contemporary Egyptians have come to utilize the term Al-Nahdah (Renaissance) to describe that educational and literary awakening with which this thesis is concerned. The writer has therefore followed this usage. The study gives special place to the contribution that Aḥmad Amīn and Lajnat al-Ta' līf have made in the general context of twentieth century Egyptian life and letters.

The renaissance in education necessitated a break with the traditional Muslim educational philosophy as exemplified in the great collegiate mosque of Al-Azhar and its affiliated ma' āhid (institutes). Early attempts were made to introduce a new philosophy through two schools; Dār al-'Ulūm (a teacher training school) and Madrasat al-Qudā'a (a school for lawyers and judges of the Sharī'ah courts). The National University was founded in 1908 on the pattern of the European schools of higher learning, while in the same quarter of the century the government began primary and secondary schools on the Western model. By mid-century the greater part of education in Egypt was of the new order.

The renaissance in literature owed much to a group of leading Syrian and Lebanese writers who emigrated to Egypt after 1882. These greatly strengthened existing efforts initiated during the rule of Muḥammad 'Alī and the Khedive Ismā'īl. The resulting literature, new in style, in content and in language, came into full flower during the second quarter of the twentieth century. As a result there now exists a vigorous, modern Arabic literature in which Egypt plays a leading role.

Aḥmad Amīn (1886-1954), the main interest of this thesis, held a position of acknowledged authority in these developments. He was born in Cario of middle class, orthodox Muslim parents. His father, an Azharite shaykh, with a wisdom unusual among his colleagues, encouraged his son in wide reading. He instilled in him a respect for freedom of thought by giving him access to the Arabic

classics without marginal commentaries so that an independence of judgement was fostered in his mind. Aḥmad Amīn was successively student at Al-Azhar; student and teacher at Madrasat al-Qudā'a; Qāḍī (lawyer) in the Sharī'ah court; teacher and Dean in Cario University; Cultural Director in Egypt and finally Cultural Director of the Arab League. His greatest contribution lay in his writings. His volumes on the history of Muslim thought have won wide academic recognition. His revealing autobiography, Ḥayātī (My Life), mirrors in personal terms many of these general changes. In countless essays, appearing almost uninterruptedly for twenty-five years in various journals of the Arab world, he advocated a new literature, social reform and the reform of religious institutions such as Al-Azhar and the mosque. His services to these causes was not limited to his pen. For forty years he directed the efforts of Lajnat al-Ta' līf. As Cultural Director he strove to disseminate the new culture among the masses through the People's Cultural Foundation, of which he was the architect, by regular radio broadcasts, and through the creation of audio-visual materials which were shown in the villages and the compounds of industries.

Lajnat al-Ta' līf was the learned society of which Aḥmad Amin was Chairman and guiding light from its genesis in 1914 until his death in 1954. It created tools for this new education by producing textbooks, reference books and the great classics of the West in Arabic. It also provided an outlet for experimentation in the new Arabic literature through the publication of writings in a variety of fields.

Sources for the study of Aḥmad Amīn and Lajnat al-Ta' līf are in Arabic. The writer covered a considerable portion of Aḥmad Amin's works in the search for relevant information, and he went through a great number of the Arabic journals for which Aḥmad Amīn wrote. He has corresponded with Aḥmad Amīn personally, with the secretary of Lajnat al-Ta' līf, with the present Cultural Director of The Arab League and with professors in the departments of Arabic literature in the universities of Beirut and Damascus. 347 pages. \$4.34. MicA 55-1954



## BIOLOGY

### BIOLOGY, GENETICS

#### A CYTOLOGICAL STUDY OF LINEAR POPULATIONS OF *DROSOPHILA AMERICANA* NEAR ST. LOUIS, MISSOURI

(Publication No. 12,791)

William Cambriel Blight, Ph.D.  
Washington University, 1955

Chairman: Hampton L. Carson

Frequencies of various chromosomal arrangements have been investigated in populations of *Drosophila americana* separated in time and space. Population samples were obtained from three principal localities along a 150-mile stretch of the Meramec River near St. Louis, Missouri. Collections were made from 1952 through 1954.

Two of the populations exhibit a high degree of stability of gene arrangements in both space and time. This stability is believed to be due to the action of natural selection in large populations. In a third population, gene arrangement frequencies fluctuate with time. Evidence from different sources suggests that this population is periodically small and subject to genetic drift.

Zygotic frequencies of the various chromosomal types indicate general conformity with predictions based on the Hardy-Weinberg equilibrium. The few exceptions are considered to be due to sampling errors. Since the cytologically defined subspecies of *D. americana* are panmitic in the St. Louis area, the taxonomic distinction in this region of the overlap zone appears to have little meaning.

Certain rare chromosomal types have been shown to arise by crossing over. The low frequencies or absence of these types is apparently due to the action of natural selection. Other rare chromosomal types which are found in nature have not been verified as crossover products and may, therefore, be remnants of an ancestral condition. A total of six inversions, previously unknown in *D. americana*, have been recovered from wild-caught flies. The fact that two of these inversions occur at more than one station suggest some degree of recent genetic exchange between spatially separated populations.

The overall picture for population structure in *D. americana* is one of large, genetically stable populations and occasional small, variable populations, with a degree of genetic continuity throughout the linear sequence in any one river valley. 59 pages. \$1.00. MicA 55-1955

## BOTANY

#### MANUAL OF THE GRASSES OF KOREA

(Publication No. 12,554)

In-Cho Chung, Ph.D.  
University of Michigan, 1955

The purpose of this work is to give full descriptions, with clear-cut keys to all categories, of all known grasses of Korea, both South and North.

The only grasses excluded from the work are cultivated bamboos.

The treatment is based as largely as possible upon material actually collected in Korea, which is available in the United States National Herbarium at the Smithsonian Institution, the Gray Herbarium of Harvard University, the University Herbarium of the University of Michigan, and the Herbarium of the New York Botanical Garden.

If material from Korea or closely adjacent regions was not available, the descriptions were either translated from the original ones, or, if those were too old and inadequate, from the best and most dependable monographs, or floras of the type regions.

So far as now known there are two hundred species of grasses in eighty-five genera in Korea, excluding cultivated bamboos.

One Siberian species, *Poa sibirica* Roshevitz, is new to Korea, and one Korean species, *Stipa pubicalyx* Ohwi, has been found to extend to the Soviet Far East, and so far as can be ascertained, is new to that country.

Three species, three varieties, and five forms are newly proposed; seven varieties and three forms have required framing new combinations in order to bring their names into conformity with the general treatment.

New names and combinations are as follows:

*Poa hamhungensis*  
*Poa kyongsongensis*  
*Poa ullungdoensis*  
*Agropyron yezoense* var. *glaucispiculum*  
*Eulalia speciosa* var. *glauca*  
*Setaria lutescens* var. *dura*  
*Agropyron kamoji* f. *muticum*  
*Ischaemum crassipes* f. *pilosum*  
*Poa ussuriensis* f. *angustifolia*  
*Poa ussuriensis* f. *scabra*  
*Polypogon higegaweri* f. *muticum*  
*Calamagrostis arundinacea* var. *heterogluma* (C. longiseta var. *heterogluma*)  
*Diarrhena fauriei* var. *koryoensis* (D. *koryoensis*)  
*Miscanthus sinensis* var. *coreensis* (M. *coreensis*)

*Miscanthus sinensis* var. *ionandros* (M. *ionandros*)  
*Miscanthus sinensis* var. *longiberbis* (M. *matsumurae*  
 var. *longiberbis*)

*Miscanthus sinensis* var. *nakaianus* (M. *nakaianus*)

*Tripogon chinensis* var. *longiaristata* (T.  
*longiaristata*)

*Eragrostis pilosa* f. *multicaulis* (E. *multicaulis*)

*Ischaemum eriostachyum* f. *stenopterum* (I. *anthepho-*  
*roides* var. *stenopterum*)

*Polypogon higeaweri* f. *demissus* (P. *demissus*)

Thirteen species and eleven varieties of grasses are endemic in Korea: eight species and three varieties in Northern Korea, three species and three varieties in Central Korea, two species and three varieties in Southern Korea, and two varieties in Central and Southern Korea.

Endemic grasses are as follows:

*Alopecurus aequalis* var. *brachytrichus* in Hamgyong-pukto

*Calamagrostis arundinaceae* var. *hymenoglossa* in Hamgyong-pukto

*Calamagrostis paishanensis* in Mt. Paektu, Hamgyong-pukto

*Calamagrostis subacrochaeta* in Mt. Nangnim, Pyongan-pukto

*Elumus mollis* var. *coreensis* in Wonsan, Hamgyong-namdo

*Festuca blepharogyna* in Mt. Sullyong

*Ischaemum coreanum* in Seoul

*Miscanthus sinensis* var. *coreensis* in Sepo, Cheju Do, Tong Do

*Miscanthus sinensis* var. *longiberbis* in Changwoni

*Miscanthus sinensis* var. *nakaianus* in Kangwondo

*Oplismenus undulatifolius* var. *elongatus* in Kwangnung, Kyonggido

*Poa deschampsoides* in Mt. Duryu, Kwanmobong, and Chailbong, Hamgyong-pukto

*Poa hamhungensis* in Hamhung, Hamgyong-namdo

*Poa kanboensis* in Mt. Kwanmobong, Hamgyong-pukto

*Poa kumgansani* in Mt. Kumgang, Kangwondo

*Poa kyongsongensis* in Kyongsong, Hamgyong-pukto

*Poa takeshimana* in Ullung Do

*Poa ullungdoensis* in Ullung Do.

*Puccinellia coreensis* in Mokpo and Cheju Do

*Sasa coreana* in Hamgyong-pukto

*Sasa quelpaertensis* in Cheju Do

*Sasamorphia borealis* var. *chiisanensis* in Mt. Chiri, Kyongsang-namdo

*Setaria lutescens* var. *dura* in Sohuksan Do

*Tripogon chinensis* var. *coreensis* in Chinnampo, Sorai in Whanghaedo, and Cheju Do

*Tripogon chinensis* var. *longiaristata* in Cheju Do

Distribution of the grasses in Korea and the nearest systematic and geographic relationships of endemic species are fully discussed. A brief classification of the grasses by habitats and a list of the important collections of Korean grasses in the four herbaria of the U. S. A. are given. A map of Korea with three divisions indicates location of important localities represented by collections in the herbaria which have been cited.

384 pages. \$4.80. MicA 55-1956

## THE CYTOLOGY OF TWO AURICULARIACEOUS FUNGI

(Publication No. 12,901)

Chun-Juan Kao, Ph.D.  
 State University of Iowa, 1955

Chairman: Professor G. W. Martin

A review of literature concerning the cytology of fungi in the Auriculariaceae is given.

The cytological study of *Xenogloea eriophori* was done with the application of Heidenhain's Hematoxylin and Trypan Blue staining techniques.

Clamp-connections and probasidia are found abundantly on the hyphae inside the leaf of *Scirpus atrovirens* instead of restricted to pustules on the leaf surface.

Stages in meiosis in the probasidia of *Xenogloea* are described. The chromosome number in metaphase I is eight.

The development of the basidium is as follows:

Karyogamy occurs in the probasidium in the leaf and is soon followed by meiosis. Meiosis is completed in the probasidium in the leaf and a mature 4-celled basidium is formed or for most of the probasidia, while the nucleus is in early prophase, a hypha grows out at the basal or central portion of the probasidium. The hypha grows toward the stoma. As soon as the hypha reaches the stoma, a saccate structure is developed at its tip. The saccate structure increases in size, in the meantime, the nucleus in the probasidium in the leaf migrates through the hypha into the saccate structure in which meiosis is completed. A 4-celled basidium is thus formed in the pustules on the lower surface of the leaf. The basidiospores germinate by repetition, by budding or by producing one to four secondary spores arranged in a fan-shaped.

Heidenhain's Hematoxylin and KOH-Phloxine staining techniques were used for the cytological study of *Syzygospora alba*.

*Syzygospora*-type basidia and the homobasidiomycete-type basidia are borne on the same hypha, thus *Syzygospora* is only a conidial stage of a homobasidiomycete.

The homobasidiomycete is probably a *Peniophora* or a closely related genus. The nuclear behavior in the development of the *Peniophora*-type basidium was not precisely followed.

The nuclear behavior in the development of the *Syzygospora*-type spores has been observed. The terminal hyphal cell is transversely septate. Each cell produces a short stalk on which a spore is borne. Two spores one from each cell fuse to form a binucleate dumbbell-shaped spore which becomes detached after it reaches maturity. Spores germinate by producing mycelium.

90 pages. \$1.13. MicA 55-1957

## THE GENUS CLAVARIA FRIES IN MICHIGAN

(Publication No. 12,605)

Chester Ray Leathers, Ph.D.  
 University of Michigan, 1955

The purpose of this study is to provide investigators of the Great Lakes Region with an accurate classification of



the species of *Clavaria* Fries. Attention has been given to the more recently segregated smaller genera which some authors have considered distinct. The segregates have been studied in terms of an evaluation of the characters used to distinguish them.

Sixty-four species are described from Michigan. Among these, *C. caulifloriformis*, *C. fuscoferruginea*, *C. rubicundula*, *C. phycophila*, *C. botrytis* var. *latispora*, *C. luteo-tenerrima* var. *borealis* and *C. pulchra* var. *globulina* are described as new. In addition to the foregoing, thirteen species and five varieties are reported from Michigan for the first time while five species and one variety constitute first reports from the United States. Keys to the identification of all sixty-four species are provided. The spores of each have been illustrated. Photographs of thirty-four species have also been included.

The characters most generally used in the classification of species have been evaluated from a study of their occurrence in both fresh and dried material. Those which have been found valuable for arranging species into large groups are: color of the reaction in ferric sulfate, shape of the fructification, spore ornamentation, shape, and color of the spore deposit. Characters which have proven worthy of emphasis in separating species include the following; taste and odor, color and color changes; spore size, type of ornamentation and the presence of an amyloid reaction; the presence or absence of cystidia and their type, if present.

Additional information has been presented concerning many species. Among these, *C. pyxidata* var. *pyxidata* is shown to have amyloid spores. A study of the type of *C. cacao* shows that the species possesses diagonally striate spores. The occurrence of clamp connections appears to have some value at the species level in the section *Ramaria* but the character is so variable in the other groups that it is not considered as reliable in distinguishing those species. Comparisons of basidial size with that of the fructification show the largest fruiting bodies to possess the largest basidia.

Variation of many of the characters most generally used in separating smaller genera from *Clavaria* Fries has been shown to be so great that several of the smaller segregates, as embodied in the monograph of Corner (1950), are not recognizable taxa.

Clavarioid fungi were found to be most numerous in forest communities where hemlock, white pine, and yellow birch are the dominant trees. Most species are terrestrial and appear restricted to heavily shaded areas where there is a rich layer of humus.

354 pages. \$4.43. MicA 55-1958

#### THE BIOSYNTHESIS OF GROWTH HORMONES IN THE PISTILS OF FLOWERS PRELIMINARY TO THE SETTING OF FRUIT

(Publication No. 12,611)

Harvey Allen Lund, Ph.D.  
University of Michigan, 1955

The purpose of this investigation has been to study the changes in hormone content in the styles and ovaries of *Nicotiana tabacum* following pollination and to correlate

the changes with the growth of the pollen tubes in the pistil of the flower. These growth hormones, which are postulated as being responsible for initiating fruit development, were then studied in greater detail as to their identity and synthesis.

Using the curvature of *Avena* coleoptiles as a criterion for the presence and concentration of the hormone, it was found that the hormone content of the apical half of the style increases shortly after pollination and decreases again thereafter, whereas the hormone content of the basal half of the style increases slightly after pollination and continues to be synthesized in this portion for a considerable time later. Hormone synthesis in the ovaries was detected two days after pollination. These changes in hormone concentration were found to be correlated with the approximate position of the pollen tubes as observed in stained paraffin sections.

The plant growth hormone which increases in the style after pollination was identified as indoleacetic acid by paper chromatographic analysis. Indoleacetic acid content also increased in the ovaries two days after pollination. Some evidence was obtained that indoleacetonitrile and other unidentified hormones are present in styles and ovaries in smaller amounts, but these do not change in concentration following pollination.

Free tryptophan, a precursor of indoleacetic acid, decreases in amount in the styles immediately after pollination probably due to the rapid synthesis of indoleacetic acid during the period of pollen tube growth. The level of tryptophan begins to increase to--or beyond--the amount found in styles from unpollinated flowers sometime later. Increases in tryptophan were noted in the ovaries two days after pollination.

The hormone concentration of pollen tubes grown in liquid culture does not change during a ten-hour period on a rotary shaker. When tryptophan was added to similar cultures and incubated for the same length of time, large amounts of indoleacetic acid were produced as determined by quantitative paper chromatography. The production of this hormone is dependent upon the concentration of substrate and the temperature of the solution. The synthesis is not due to bacterial growth, and must, therefore, be associated with enzymes within or secreted by the pollen tube.

Enzymes capable of converting tryptophan to indoleacetic acid increase in activity after pollen germination *in vitro* as indicated by crude enzyme preparations. Greater enzymatic activity was induced by growing the pollen tubes in the presence of tryptophan. The enzymatic activity also increases in the stylar tissues shortly after pollination. There is a basal rate of enzymatic activity in the ovary before pollination and this rate increases at approximately the time that the pollen tubes are entering. The activity then increases with time in this tissue.

Therefore, it is concluded that the pollen tubes supply to the style an increased amount of enzymes which are able to oxidize tryptophan to indoleacetic acid. As the pollen tubes grow toward the ovary, a wave of hormone synthesis, which follows quite closely the pollen tube growth, is observed in the styles. The increased synthesis of indoleacetic acid in the styles and ovaries then results in the initiation of ovary enlargement and, thus, fruit development.

125 pages. \$1.56. MicA 55-1959



# THE CULTURE OF EXCISED OVULES, ENDOSPERM AND EMBRYOS OF CERTAIN GRASSES

(Publication No. 12,630)

Knut Jonson Norstog, Ph.D.  
University of Michigan, 1955

The study deals with various problems of grass embryogenesis *in vitro*. Attempts were made to obtain differential growth of embryonic structures and continued growth of cultured embryos beyond that which takes place *in vivo*. The possibility of culturing excised immature ovules of certain of the grasses also was investigated.

Part I. Various modifications of White's medium were used in cultures of excised embryos of oats, wheat, barley and rye. Cultures of mature embryos failed to produce the desired results except that in oats, extreme coleorhizal elongations were observed. It was determined that these elongations occurred as a result of lowered oxygen tension. Numerous cultures of immature embryos were made. Most of these were of uniform size (0.8 mm.) although some cultures were made using embryos of barley as small as 0.15 mm. It was found that a medium containing 90 per cent coconut milk allowed embryonic differentiation to continue *in vitro*. In no instance, however, did such growth exceed that occurring *in vivo*. An embryo 0.15 mm. in length when excised eventually grew into a well developed seedling on this medium. Other substances were also tried. Indole-3-acetic acid was ineffective. Yeast extract was not as good as coconut milk. Adenine sulfate produced coleorhizal elongations in oat and barley embryos, but did not noticeably affect the growth of other parts of the embryos. Other development on the part of embryonic tissues and organs are noted and discussed in this study.

Part II. Cultures of excised immature ovules of wheat, barley, rye and English rye grass (*Lolium perenne* L.) did not continue to grow *in vitro* except in two instances. Several ovules of barley grew for a time. The endosperms of rye grass continued to grow and was subcultured many times. This tissue was cultured on various media. It showed an increase in dry weight of 1678 per cent when cultured three weeks on White's agar containing 0.50 per cent yeast extract and 1.0 mg./l. Indole-3-acetic acid. Growth also was obtained on coconut milk media. The effects of temperature, light, dark, and pH on the growth of the tissue were determined. The most rapid growth occurred at 26° C. and pH 7. There was no difference between the growth in light and in dark. The tissue continued to store starch *in vitro*. Chromosomal aberrations were frequent. The basic chromosome number of the cultured tissue was 21 (3n). Larger numbers were observed. Chromosome bridges also were frequent. These aberrations (hyperploidy and bridge) were associated with the formation of large starch storage cells. The tissue did not differentiate other than in chromosome configurations and starch storage. Tracheids did not occur nor did organization take place.

Attempts to culture embryos in contact with the endosperm tissue or on extracts of endosperm tissue failed to produce conclusive results.

168 pages. \$2.10. MicA 55-1960

# PHYTOPHTHORA ROT OF SUGARCANE

(Publication No. 12,529)

Kishan Singh, Ph.D.  
Louisiana State University, 1955

Supervisor: Professor Rene J. Steib

Disease surveys for germination failures of sugarcane in Louisiana were made in the spring of the years 1953, 1954 and 1955. Two different Phycomycetes were frequently isolated from ungerminated seed pieces. One of them, which produced large oogonia and amphigynous antheridia, was identified as *Phytophthora erythroseptica*. The other isolate did not produce any fruiting structure on any kind of solid or liquid synthetic medium. This isolate has been called the "sterile isolate" in this work.

Different media, lights, temperatures, pH, and hosts were tried in an effort to induce sporulation in the sterile isolate. Sporangia and oogonia were produced on the young roots of sugarcane, near the root tips. These structures were measured. Sporangia were pyriform and released zoospores.

Cultural studies with both isolates were conducted. *P. erythroseptica* grew best at 21° C. For the "sterile isolate" 11° C. was found to be the most favorable temperature for growth. The optimum pH level was found to be at 3.9 to 4.0 for both isolates. A second best range was found between 6.3 and 6.6.

During different inoculation experiments it was noted that the "sterile isolate" was more pathogenic than *P. erythroseptica*.

Stalk inoculations were tried with different varieties in 1953-54 and 1954-55. Inoculation of the setts also was affected by planting in soil infested with the organisms. In the successful inoculation experiments conducted in tubs with varieties C.P. 36-13, C.P. 36-105, and C.P. 44-101 the soil was sterilized prior to infestation.

Soil infestation in the field was found to be ineffective and it was assumed that soil microorganisms checked the growth of the added isolates.

Insertation of inoculum into the stalks was found to be a better method of inoculation, under field conditions. A number of varieties were inoculated successfully by this technique.

Experiments were conducted on the relationship of soil moisture to the extent of infection of the seed pieces. Moisture levels of 50 to 80 per cent were found to be most favorable for *Phytophthora* infection. The pathogenicity of different varieties at different levels of soil moisture was found to be different.

Nodal infection was found to be occurring. Isolations from the nodes indicated that the infection might be taking place through root primordia.

In the light of the experimental findings it appeared that in cool and wet winters widespread stand failures of sugarcane, attributable to *Phytophthora* rot, may be expected. The condition particularly may be anticipated in areas of heavy soils, high water table and bad drainage.

147 pages. \$1.84. MicA 55-1961

## CHEMISTRY

### CHEMISTRY, GENERAL

#### THE DEVELOPMENT OF A GENERAL EDUCATION COLLEGE CHEMISTRY COURSE

(Publication No. 12,765)

Luther A. Arnold, Ed.D.  
The University of Florida, 1955

##### Purpose of the Study

The purpose of the study is to develop philosophically a first-year general education college chemistry course which will serve the general education student as well as the specializing student. The course is based upon modern philosophy of science and education with emphasis upon objective scientific thinking.

##### Assumptions in the Development of the Course

Four assumptions are made as a basis for the course:

1. That in our democratic society objective thinking based upon understanding of scientific principles relating to the structure and interaction of matter leads to a better life and should, therefore, be a part of the education of all.
2. That the chief function of a general college chemistry course is to provide experience in objective thinking regarding the structure and interaction of matter, especially as it relates to life in our society and culture.
3. That one learns most effectively when new learnings are associated with past experiences as they are meaningful to the individual in controlling, predicting, and testing future experiences.
4. That a general education chemistry course should begin with modern atomic theory and be developed upon it.

##### Criteria in the Development of the Course

To select and organize content and experiences in keeping with these basic assumptions, criteria were established. Applying the fourth assumption, those materials concerning the atom which were also in agreement with the other basic assumptions were considered. The criteria are:

1. Relatedness — of each part to the basic assumption regarding the atomic theory, of each part to each other part, of each part to the importance chemistry plays in the life of the individual, and of each part to the past experience of the student.
2. Flexibility and variability — in its provision for individual differences and its adjustability to environmental factors.
3. Continuity — in its relation to logical sequence and dependence upon past experience leading to new experience.
4. Interaction — between student and instructor and among students leading to active participation.
5. Motivity — in its provision for continuing interest.
6. Harmony — with sound educational philosophy, with democratic processes, with modern philosophy of science, and with what is known about the structure and behavior of matter.
7. Effectiveness — in developing objective thinking and a practicable and usable philosophy of life.

##### Identification of Principles

To ascertain that important aspects of chemistry were not overlooked, a list of statements relating to the structure and behavior of matter was compiled from major sources and submitted to a jury of eighteen specialists, nine in general education and nine in chemistry instruction. Fifteen ratings were received, seven from the general education field and eight from the specialist field. Three hundred and seventy-six statements were judged to be essential and have been arranged in logical sequence according to the plan of the course.

##### Conclusions and Suggestions for Further Study

The course incorporating the conclusions of the study is designed to meet the criticisms referred to in the introductory chapters.

The study brings to attention several areas worthy of further study:

1. An evaluation of the course in practice.
2. The preparation and qualifications of college chemistry instructors.
3. The practice of employing graduate and teaching assistants whose interest may not be in teaching.
4. Responsibilities of general chemistry instructors and their effect upon teaching.
5. The role of the laboratory.
6. The influence of testing practices on objective thinking.

If first-year college chemistry is to make greater contribution in satisfying the needs of all students, it would appear that the whole field should be critically investigated. Such investigation would be in harmony with the philosophy of science which science instructors should promote.

154 pages. \$1.93. MicA 55-1962

### CHEMISTRY, BIOLOGICAL

#### THE HEAT DENATURATION OF BETA-LACTOGLOBULIN AND ALPHA-LACTALBUMIN

(Publication No. 13,314)

Charles Albert Anderson, Jr., Ph.D.  
University of Minnesota, 1955

Adviser: Robert Jenness

The heat denaturation of beta-lactoglobulin was investigated. The energy of activation,  $E$ , for the process was found to be approximately 80,000 cal./mole when heating was carried out in phosphate buffer having a pH of 6.47 and an ionic strength of 0.1. This value for  $E$  is essentially the same as that obtained by other workers who followed the process by the use of SH measurements.



Optical rotation measurements cannot be used as an independent method for determining the extent of heat denaturation of beta-lactoglobulin because the optical rotation of "completely" heat denatured protein is not constant.

The rate of heat denaturation of beta-lactoglobulin is markedly affected by changes in pH. This suggests that an ionization step is necessary in order to prepare the molecule for the kinetic step of activation. The heat of dissociation involved in this ionization step should be subtracted from the empirical energy of activation,  $E$ , to give the true energy of activation.

A partially heat denatured sample of beta-lactoglobulin was separated into a soluble and insoluble fraction by adjusting the pH to 5.0. The soluble fraction had all the properties of the native protein whereas the insoluble fraction had essentially the same electrophoretic pattern and SH activity as "completely" denatured protein. This suggests that within a certain range the reaction is of an "all or none" type. At higher temperatures, however, the reaction is not of the "all or none" type since the optical rotation of the insoluble fraction varies depending on the temperature at which the protein is denatured.

Electrophoretic measurements showed that the heat denaturation of beta-lactoglobulin at 80° C. was a second order reaction. Acid precipitability measurements, on the other hand, indicated that the process was first order in the temperature range 65° to 73° C. The reason for this change in order of reaction with temperature was investigated. The results confirm the idea the heat denaturation is a stepwise process in which the overall reaction sequence is: Native  $Rx1$  Primary denatured  $Rx.2$  Secondary denatured. Reaction (1) was found to be the limiting one over the temperature range 65° to 73° C. whereas reaction (2) was limiting at 80° C. This may explain why the heat denaturation reaction is first order at 70.5° C. and second order at 80° C. Reaction (1) is essentially an intramolecular process involving the uncoiling of the molecules and might therefore be expected to be first order. Reaction (2) is an intermolecular process involving the polymerization of the denatured molecules and might well be expected to follow second (or higher) order kinetics.

The oxidation of the SH groups of beta-lactoglobulin prior to heat denaturation greatly increases the rate at which the protein is converted into its fast electrophoretic form. The evidence supports the idea that this effect is principally due to a decreased ability of the oxidized protein to polymerize with itself through sulfur-sulfur bond formation.

Alpha-lactalbumin was found to be relatively stable to heat but could be denatured at a moderate at temperatures around 80° to 85° C. The denatured protein has a lower solubility at its isoelectric point, and has a greater electrophoretic mobility and sedimentation constant than the native protein. The stability of the protein is believed to be, at least in part, due to its high content of disulfide bonds inasmuch as the addition of small amounts of cysteine (which can reduce disulfide bonds) greatly accelerates the rate of denaturation of the protein.

Beta-lactoglobulin and alpha-lactalbumin interact to a limited extent when mixtures of the two proteins are heated. Destruction of the SH groups of beta-lactoglobulin by oxidation or by treatment with iodoacetamide destroys its ability to form aggregates with alpha-lactalbumin. This suggests that the co-polymerization of the two proteins is the result of a chain reaction involving the heat activated SH

groups of beta-lactoglobulin and the disulfide linkages of alpha-lactalbumin. 126 pages. \$1.58. MicA 55-1963

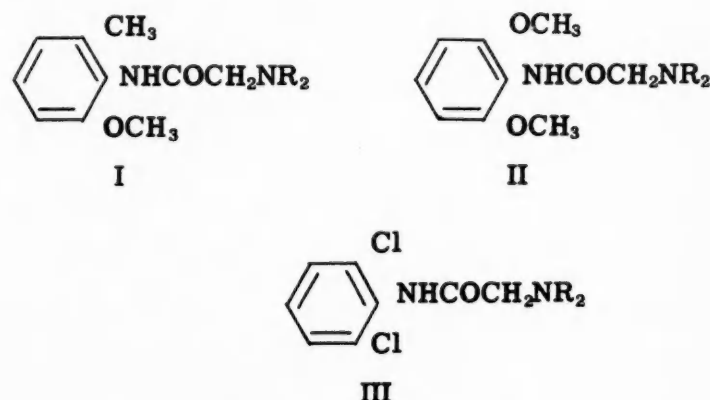
**PART I. THE SYNTHESIS OF SOME NEW LOCAL ANESTHETICS. PART II. THE SYNTHESIS OF SOME NEW HALOGEN-SUBSTITUTED PRESSOR AMINES. PART III. THE INHIBITION OF ANAEROBIC GLYCOLYSIS BY SODIUM N-LAUROYLSARCOSINATE.**

(Publication No. 13,075)

John Anthony Carbon, Ph.D.  
Northwestern University, 1955

**PART I. THE SYNTHESIS OF SOME NEW LOCAL ANESTHETICS**

The object of this work was to synthesize compounds of the general types I, II, and III.



In each series of compounds the R-groups used were methyl, ethyl, n-propyl, and n-butyl. Thus a total of twelve free bases were synthesized along with their corresponding hydrochlorides, and their physical properties described.

The general method used was to first treat the appropriate 2,6-disubstituted aniline with chloroacetyl chloride in an acetate buffer to produce the corresponding chloroacetylated compound. The 2,6-disubstituted- $\omega$ -chloroacetanilide thus produced was treated with the appropriate dialkylamine in anhydrous benzene solution to form equivalent quantities of the 2,6-disubstituted- $\omega$ -dialkylaminoacetanilide and the dialkylamine hydrochloride. These substances were converted to the hydrochlorides by dissolution in dry ether and subsequent saturation with dry hydrogen chloride.

Pharmacological testing was carried out on each compound for anesthetic potency, irritation, and toxicity. The members of series I and III possessed anesthetic potencies greater than series II. Increasing the length of the R-groups from methyl to n-butyl had the effect of increasing both the anesthetic potency and toxicity. Although several of the compounds displayed potencies equal to or greater than Xylocaine, they were not subjected to clinical testing due to their tissue-irritating properties.

**PART II. THE SYNTHESIS OF SOME NEW HALOGEN-SUBSTITUTED PRESSOR AMINES**

2-Chloro-4-hydroxy- $\alpha$ -methylaminomethylbenzyl alcohol hydrochloride and the corresponding  $\alpha$ -ethyl derivative were synthesized and tested for vaso-pressor activity on the dog.



These compounds were prepared by esterification of m-chlorophenol with chloroacetyl chloride to produce m-chlorophenyl chloroacetate, which was subjected to the Fries reaction to yield 4-chloro-2-hydroxy- $\omega$ -chloroacetophenone and 2-chloro-4-hydroxy- $\omega$ -chloroacetophenone. The latter compound, when treated with the appropriate N-alkylbenzylamine to produce a 2-chloro-4-hydroxy- $\omega$ -(N-alkylbenzylamino)acetophenone hydrochloride, followed by catalytic debenzoylation and reduction, gave the desired compounds in moderate yield.

2-Chloro-4-hydroxy- $\alpha$ -methylaminomethylbenzyl alcohol hydrochloride displayed a pressor activity only 1/400-1/500 that of epinephrine, while the corresponding  $\alpha$ -ethyl derivative was even weaker, being only 1/600 as active as epinephrine. Duration of action was slightly prolonged with the ethyl derivative.

Since synephrine is approximately 1/50 as active as epinephrine, it appears that chlorine substitution on the 2-position reduces the pressor activity approximately by a factor of ten.

### PART III. THE INHIBITION OF ANAEROBIC GLYCOLYSIS BY SODIUM N-LAUROYLSARCOSINATE

Since sodium N-lauroylsarcosinate (SLS) has recently been shown to significantly reduce acid formation and calcium dissolution when incubated with fresh saliva, glucose, and finely ground dental enamel, it has been suggested that this compound acts by inhibiting one or more of the enzymatic reactions of the Embden-Meyerhof pathway for conversion of glucose to lactic acid by oral bacteria. In order to test this theory and to determine the effectiveness of SLS as an enzyme inhibitor, a study of a few of the principle reactions of the glycolytic scheme was carried out, including a determination of their rates in the presence and absence of the inhibitor.

This compound, in concentrations as low as 1.0 millimolar, was found to be effective in reducing the overall rate of glycolysis by intact yeast cells, and also prevented the uptake of inorganic phosphate from the medium and glucose degradation by acetone-dried yeast.

Using a partially purified preparation of yeast hexokinase, this enzyme was found to be strongly inhibited by SLS concentrations as low as 1.0 millimolar. This inhibition could be prevented by a large excess of the magnesium ion, due to precipitation of magnesium N-lauroylsarcosinate.

The aldolase reaction was studied using a dialyzed cell-free yeast extract as the enzyme source. This enzyme was completely inhibited by 4.3 millimolar SLS.

Even though SLS forms a relatively insoluble magnesium salt or complex, yeast enolase was not inhibited by SLS concentrations as high as 5.0 millimolar. It is concluded that sodium N-lauroylsarcosinate does not act by complexing essential metallic co-factors, but possibly by adsorption onto the protein molecules, much like other surface-active agents.

101 pages. \$1.26. MicA 55-1964

### TRANSFORMATION PRODUCTS RESULTING FROM CORTISONE AND CORTISOL PERFUSION THROUGH RAT LIVERS

(Publication No. 13,010)

Eliahu Caspi, Ph.D.  
Clark University, 1955

Following the discovery that cortisone and cortisol possess beneficial effects in disease processes, perfusion studies were undertaken to identify the products of transformation of these steroid hormones by isolated organs. Information derived from *in vivo* studies on human urine of hepatic disease and *in vitro* investigations of tissue metabolism of estrogens, androgens and progesterone indicated that the liver was the major organ of steroid hormone catabolism. It was of particular interest thus to investigate the *in vitro* liver metabolism of cortisone and cortisol in detail.

Cortisone and cortisol-4- $C^{14}$  were perfused through isolated rat livers in citrated bovine blood. The methods used in processing of the incubated material consisted of solvent extraction of the perfusates, solvent partitioning of the extracted residues, adsorption chromatography and systematic paper chromatography. This led to the isolation of a series of metabolites which were further purified by crystallization and identified. The basic criteria for identification were the comparison of the infrared absorption spectra of the metabolites with those of authentic samples. This was supplemented by melting point and mixed m.p. determinations, comparison of absorption spectra of solutions in methanol and sulfuric acid and by color reactions.

From the cortisone perfusate the following metabolites were isolated:

Allopregnane-3 $\beta$ ,17 $\alpha$ ,20 $\beta$ ,21-tetrol-11-one  
 $\Delta^4$ -Pregnene-11 $\beta$ ,17 $\alpha$ ,20 $\beta$ ,21-tetrol-3-one  
 $\Delta^4$ -Pregnene-17 $\alpha$ ,20 $\beta$ ,21-triol-3,11-dione  
Allopregnane-3 $\alpha$ ,11 $\beta$ ,17 $\alpha$ ,21-tetrol-20-one  
Allopregnane-3 $\beta$ ,11 $\beta$ ,17 $\alpha$ ,21-tetrol-20-one  
Allopregnane-3 $\beta$ ,17 $\alpha$ ,21-triol-11,20-dione  
Allopregnane-3 $\alpha$ ,17 $\alpha$ ,21-triol-11,20-dione  
 $\Delta^4$ -Pregnene-11 $\beta$ ,17 $\alpha$ ,21-triol-3,20-dione  
Androstane-3 $\alpha$ -ol-11,17-dione  
 $\Delta^4$ -Androstene-3,11,17-trione

A more critical evaluation of methods and recoveries were carried out with cortisol-4- $C^{14}$ . Following the perfusion of  $4 \times 10^6$  c/m. of cortisol-4- $C^{14}$  (200 mg.),  $2.23 \times 10^6$  c/m. (56%) were recovered by extraction and preliminary purification. A portion of the partially purified extract, containing  $2 \times 10^6$  c/m., was systematically fractionated giving rise to a series of fractions totalling  $1.43 \times 10^6$  c/m. equivalent to 71.8% of the above quantity. The location of the spots on the papergrams was detected by radioautography. The recovered material contained  $343 \times 10^3$  c/m. of cortisol-4- $C^{14}$  which was not transformed during the perfusion.  $1.09 \times 10^6$  c/m. of cortisol metabolites were thus obtained. The quantitative relationship of identified products in the latter fraction was as follows:

Allopregnane-3 $\beta$ ,11 $\beta$ ,17 $\alpha$ ,20 $\beta$ ,21-pentol	38.9%
Allopregnane-3 $\beta$ ,11 $\beta$ ,17 $\alpha$ ,21-tetrol-20-one	19.3%
$\Delta^4$ -Pregnene-11 $\beta$ ,17 $\alpha$ ,20 $\beta$ ,21-tetrol-3-one	15.0%
Androstane-3 $\beta$ ,11 $\beta$ , -diol-17-one	2.0%
$\Delta^4$ -Androstene-11 $\beta$ -ol-3,17-dione	9.4%

About  $167 \times 10^3$  c/m. of the metabolites could not be identified.

From the results of these studies it was possible to outline a tentative scheme for the catabolism of cortisone and cortisol in rat liver perfusion. The products identified were predominately reduced derivatives of the parent hormones. Those reduced in ring A were of the "5 $\alpha$ " configuration. The reduction of the carbonyl at C-3 in cortisone led to the isolation of the "3 $\alpha$ " and the "3 $\beta$ " alcohols. From cortisol only the "3 $\beta$ " alcohols were obtained. The conversion of the ketones at C-11 and C-20 to the "11 $\beta$ " and "20 $\beta$ " hydroxyls was demonstrated. The oxidative cleavage of the side chain was observed yielding the 19-C analogues.

126 pages. \$1.58. MicA 55-1965

#### ASPECTS OF CHLORIDE METABOLISM IN HEALTH AND DISEASE

(Publication No. 12,946)

Donald Brook Cheek, Sc.D.  
University of Cincinnati, 1955

The chloride space is defined as the virtual volume of distribution of chloride in the body a volume in which the chloride concentration is equal to that of an ultrafiltrate of serum. On the premise that the chloride ion maintains almost an entirely extracellular position in the body it is possible to divide total body water into an intra- and extracellular phase or space.

This dissertation and its supporting papers are concerned with a physiological and pathological study of the chloride space. The recognition that serum concentration of an electrolyte per se is a concentration in an unknown volume is repeatedly emphasized (total amount = volume of distribution  $\times$  concentration). Initially the known factors influencing chloride and sodium excretion are mentioned. New information is added with respect to the influence of expansion of extracellular and intracellular volume on chloride excretion.

The evidence for believing that chloride is predominantly extracellular is reviewed, first in isolated tissue studies and secondly, with respect to the whole animal. The tentative conclusion is reached that probably no more than 10 per cent of chloride, and possibly less, is intracellular--excluding red blood cells which are in equilibrium with the extracellular fluids, and are available for analysis. Attention is drawn to the outstanding usefulness of Br as a measure of the chloride space and a simple method for micro-bromide assay, based on the E. J. Conway technique is advocated. It is shown that if the bromide space is subjected to certain legitimate corrections an approximation to true extracellular volume can probably be obtained. In the dog at least this figure is close to the value predicted by other workers.

Data from whole carcass analysis and chloride content of 35 rats are presented, and it is shown that the average value for the chloride space so obtained is very close to that for exchangeable chloride (as measured by bromide) of these same rats. The total exchangeable chloride of dogs by bromide is shown to be close to the carcass analysis on 2 dogs, completed by previous workers.

It is shown that the widely used silver nitrate-nitric acid method (open Carius method) for chloride is unsatisfactory for carcass analysis if heat above 100°C is used

for digestion of tissue. A method adapted from Conway is described whereby tissue chloride can be reliably estimated, using only 150 mg of dried fat free solid. The standard error of analysis for a single determination is  $\pm 0.19$  mEq per 100 grams of fat free dried solid. In the rat the carcass chloride by the latter method and by the silver method (without excess heat for digestion) give results that agree with the total chloride as measured by bromide.

It is shown that during growth and development for infants and children total body chloride bears a linear logarithmic relationship to body weight whereas in rats a simple relationship exists between total chloride and lean body mass. This relationship holds also for total body water and for total potassium in rats.

The relationship of the chloride space to the sodium space is reviewed and also the changes incurred by alteration of potassium metabolism. The different types of edema encountered clinically are discussed and the current evidence for chloride retention is considered. Alteration of the chloride space in the absence of the adrenal gland is discussed, and data are presented in a supporting paper demonstrating that in water intoxication the chloride space and non-chloride space expand commensurately with the solute they contain--or water distributes proportionately to the situation of body solute. Attention is drawn to the preferential retention of water in the chloride space when DCA is given in water intoxication.

Changes in the chloride space are also considered under conditions of electrolyte loss and a study is presented concerning the distribution of water in gastro-enteritis during initial treatment with high and low salt loads. High Na Cl loads are accompanied by a delayed restoration of acid base balance and in some instances by sodium chloride retention and edema. Subtraction of cell water occurs in some cases, as a result of high loads of Na Cl initially.

Alteration of electrolytes in disease of the central nervous system is discussed, and it is clearly shown that in 12 out of 13 patients with tuberculous meningitis there was a normal or increased total body chloride with a low serum chloride concentration and hypokalemic alkalosis. Hypotonic expansion of the extracellular fluid is thus demonstrated. Lastly, the effect of mercurial preparations on the chloride space is discussed and it is shown by balance data, endocrine investigations, chloride space studies and serum electrolyte studies, that there is an alteration of physiologic function and body composition in acrodynia that is impressively similar to the known and adverse effects of mercury. The need for Cl, K and Na administration to these cases is mentioned and the possible favorable antagonism to salt losses by adrenal steroids is suggested.

142 pages. \$1.78. MicA 55-1966



**STUDIES ON THE DETERMINATION OF INULIN AND EVANS BLUE IN BLOOD AND TISSUES**

(Publication No. 13,320)

Donald Frederick Clausen, Ph.D.  
University of Minnesota, 1955

Major Adviser: Cyrus P. Barnum, Jr.

In using the Seliwanoff reaction for the determination of inulin it was found that new specifications of heating time and temperature were more advantageous. To 3.0 ml of an aqueous solution of inulin were added 1.0 ml of 0.1% resorcinol in glacial acetic acid solution and 6.0 ml of concentrated HCl. After mixing, this preparation is heated for 60 minutes at 62.5°C. followed by cooling in a tap water bath for five minutes.

A method was devised for the determination of Evans blue dye in dog and rat tissues. Five grams of tissue are minced or ground in a meat grinder. To the ground tissue a solution of urea (equal weights of A.R. urea and water) is added until the volume is 100.0 ml. This preparation is homogenized for ten minutes in a Waring Blendor and then cooled five minutes in a tap water bath. Two hundred milliliters of A.R. acetone are added and the mixture is shaken momentarily. Ten milliliters of Somogyi reagent One (10% zinc sulfate 7H<sub>2</sub>O) are added and the mixture is momentarily shaken. Ten milliliters of Somogyi reagent Two (0.5N NaOH) are added and the mixture is shaken mechanically for ten minutes. After standing 15 minutes the mixture is filtered through Whatman no. 42 paper. The optical density is determined at 620 mmu using a colorimeter or spectrophotometer equipped with a 20.0 cm cuvette. The solution used for the I<sub>0</sub> settings consists of a reagent blank carried through all steps except homogenization. The standard solutions consist of known amounts of Evans blue added to 5.0 gram aliquots of dye-free tissue and carried through the entire procedure.

The recovery of Evans blue added to various samples of dog and rat tissues was 100 plus or minus 2 per cent. The recovery of dye injected into rats wherein the whole rat was taken for analysis was 100 plus or minus 3 per cent. In the case of analyses of whole rats weighing 400 grams the presence of Fox Chow in the gastrointestinal tract of the animal might produce positive errors of 7% if 8 mgm of dye were injected. This is because of the fact that Fox Chow produces a deep green color in the final filtrate.

The method for the determination of Evans blue in tissues is sensitive in the range of 10 to 20 mgm of dye per kilogram of tissue. Blood pigments up to 2.5 ml of added blood per five grams of tissue do not interfere in the method.

The method may be used for the determination of Evans blue in whole blood. From 0.5 to 2.0 ml of whole blood containing not over 0.125 mgm of dye, with normal saline added if necessary to bring the volume to 2.0 ml, is treated with 2.0 ml urea solution (equal weights of urea and water) and 0.5 ml each of the two Somogyi reagents. After shaking and centrifugation the dye concentration is determined in the supernatant liquid at 620 mmu. An ordinary colorimeter may be used. The solution used as I<sub>0</sub> is made of all reagents with water replacing the blood. The solutions used as standards are made from known amounts of dye added to dye-free blood and run through the entire procedure.

The method was applied to a determination of the amount of injected dye that appears in the liver and spleen. It was found that up to four hours after injection the liver contains roughly 10% and the spleen contains roughly 1.0% of the injected dye.

Forty hours after injection into rats up to 73% of the injected dye can be recovered from the body but only 8% of the injected dye can be recovered from the blood.

83 pages. \$1.04. MicA 55-1967

**THE EFFECT OF HORMONES AND STRESS UPON CERTAIN COENZYME A DEPENDENT REACTIONS**

(Publication No. 12,892)

John Matthias Franz, Ph.D.  
State University of Iowa, 1955

Chairman: Assistant Professor Gene F. Lata

**I. Sulfanilamide Acetylation *in vitro* and *in vivo***

Studies concerning the effect of hormones on *in vitro* sulfanilamide acetylation which had previously shown that commercial insulin, adrenalin, thyroxin and ACTH had no effect were continued. In a sulfanilamide acetylating system essentially according to Lipmann, low zinc insulin (4-5 units per 2.5 ml.), growth hormone (0.1 gamma to 600 gamma per ml.), cholesterol (0.07 to 2.10 mg. per 2.5 ml.), ergosterol (0.06 to 1.90 mg. per 2.5 ml.),  $\alpha$ -estradiol (0.03 to 0.08 mg. per 2.5 ml.), and isoandrosterone (0.02 to 0.60 mg. per 2.5 ml.) had no effect but testosterone above 0.128 mg. per 2.5 ml. (+23%), progesterone above 0.10 mg. per 2.5 ml. (+22%), cortisone above 0.08 mg. per 2.5 ml. (+17%) and desoxycorticosterone acetate above 0.05 mg. per 2.5 ml. (+15%) stimulated acetylation to the degree indicated. The steroids which stimulated acetylation, and only those, had the  $\Delta^4$ -3-keto structural moiety.

A study of *in vivo* sulfanilamide acetylation in Sprague-Dawley albino rats has shown that male rats, when injected with sulfanilamide at a 70 mg. per kilo. level, acetylated 27.1% more than females of the same age and strain. Female rats injected with 0.5 mg. testosterone propionate daily (for 13 to 57 days) increased their acetylation of injected sulfanilamide 13%. Castration of male rats (13 to 57 days before injection) had no significant effect on the amount of acetylation of injected sulfanilamide.

**II. Lipogenesis in the Guinea Pig**

Incorporation of acetate-1-C<sup>14</sup> into cholesterol, fatty acid, and miscellaneous lipid fractions of the liver and adrenal and into blood fatty acids occurred very rapidly reaching a peak for the adrenal in 50 to 70 minutes and for the liver 35 to 50 minutes. Significant incorporation into blood lipids occurred only in the fatty acid fraction during the 2 hour period studied and this reached a peak in approximately 65 minutes. Incorporation into brain lipid fractions was virtually insignificant over the 2 3/4 hour period studied.

Alterations in guinea pig lipogenesis observed as the result of a 24 hour fast are: an increase in adrenal



cholesterol and corticosteroid synthesis with a corresponding decrease in liver cholesterol and adrenal and liver fatty acid synthesis. This is accompanied by some increase in blood total cholesterol but no change in the cholesterol content of the entire liver.

Alterations in fed guinea pig lipogenesis observed 11-12 hours after an injection of 50 U.S.P. units of ACTH are: a sharp lowering of adrenal cholesterol with no effect on its synthesis but an increase in corticosteroid synthesis. This is coupled with a slight lowering of liver glycogen.

102 pages. \$1.28. MicA 55-1968

**INTERSPECIES COMPLEX FORMATION IN  
DENATURED PROTEIN MIXTURES.  
SOME OBSERVATIONS ON THE FORMATION OF  
INTERMOLECULAR HYDROGEN AND DISULFIDE  
BONDS DURING THE AGGREGATION  
ACCOMPANYING PROTEIN DENATURATION.**

(Publication No. 13,326)

Robert Arthur Fuller, Ph.D.  
University of Minnesota, 1955

Studies are reported on the formation, as a result of denaturation by heat or urea, of complexes or aggregates between molecules of different species in a protein mixture. Bovine serum albumin, beta-lactoglobulin, ovalbumin, lysozyme and conalbumin were studied individually as well as the following combinations of these proteins: beta-lactoglobulin-serum albumin; ovalbumin-serum albumin; conalbumin-lysozyme. A brief study of horse serum was also made. Investigations of complexes between proteins ("interspecies complexes") were carried out primarily by electrophoresis where the presence or absence of a complex could be determined readily by observing the number of peaks in the electrophoretic pattern. Ultracentrifugal and light scattering techniques also were employed.

Interspecies complexes were found to be accompanied by the formation of both disulfide and hydrogen bonds between molecules of the different protein species. These complexes could be broken down by treatment with 6 M urea and 0.2 M sodium sulfite. The original protein species could then be reidentified after removal of the complex-splitting agents.

Serum albumin and beta-lactoglobulin heated singly or together were restored to the size and mobility of their native forms by the urea and sulfite treatment. Ovalbumin must have undergone aggregation by an additional mechanism because treatment with urea and sulfite, although it freed ovalbumin from a complex with serum albumin, did not restore this protein to its native size. All of these regenerated proteins had a much lower solubility than the native forms at their isoelectric points.

Several attempts to prevent interspecies complex formation, particularly by prior heating or by tying up the favailable sulfhydryl groups of the protein are described. These met with varying degrees of success. Lysozyme and conalbumin, neither of which contains sulfhydryl groups, were shown not to interact with one another when denatured together by urea or heat unless sulfhydryl groups were made available.

The formation of disulfide bonds between protein

molecules seems to be the more important of the linkages found to be involved in interspecies complex formation in the artificial mixtures of proteins studied. The mercaptan transfer reaction through which these disulfide bonds predominately are formed was found for serum albumin to take place in the presence of 6 M urea. Evidence is presented to favor the idea that the mercaptide ion is necessary for the mercaptan transfer reaction, and that this ion is present in appreciable amounts down to pH 5.5 for serum albumin. This favors the reversal of the previously accepted assignment of pK values for sulfhydryl groups and alpha-amino groups in proteins, in agreement with other recent work.

The proteins of horse serum appear to aggregate by at least three mechanisms to form a single electrophoretic species after heating. Disulfide and hydrogen bonds were involved in the aggregation, but their disruption by urea and sulfite, although it had a marked effect in restoring the normal appearance of the serum solution from the gel formed on heating, failed to separate the different protein components as determined by the electrophoretic pattern. Thus at least one other bonding mechanism, in addition to those found in the artificial mixtures of proteins, must be involved.

Explanation of divergent reports, in the literature, concerning the behavior of proteins in urea with respect to aggregation, has resulted from these studies. A number of other earlier observations on protein denaturation have also been clarified.

254 pages. \$3.18. MicA 55-1969

**STUDIES ON THE CHEMISTRY OF  
BONE SALT FORMATION**

(Publication No. 13,205)

Roderick Patterson MacDonald, Ph.D.  
Wayne University, 1952

Adviser: Adrian C. Kuyper

Inorganic precipitates and their supernatant solutions having compositions similar to bone and serum ultrafiltrate respectively were prepared by equilibration of salt solutions under physiological conditions. An equation was derived on the basis of theoretical considerations for the expression of the relation of the composition of the precipitates to their supernatant solutions. In this equation the term "negative log factor" expressed the composition of the supernatant solution with relation to any given carbonate/phosphate ratio of the precipitate. When the conditions of equilibration were altered by varying the ratio of calcium to phosphate, the bicarbonate concentration, adding magnesium, or changing the pH of the supernatant solution, the relationship was found to hold. Commercial calcium phosphate (which also contained carbonate) was equilibrated under similar conditions for a suitable period of time, and the analytical data were substituted into the equation. A straight line relationship existed. Mixtures of commercial calcium phosphate and calcium carbonate were equilibrated and found to give similar results.

In order to demonstrate that the measurements were obtained under equilibrium conditions, preformed precipitates were equilibrated with solutions of varying calcium,

phosphate, and bicarbonate concentration, and at varying pH values. Under all these conditions, with the exception of low bicarbonate concentrations, equilibrium was reached at a new composition as predicted by the theoretically derived equation.

Tricalcium phosphate was prepared and equilibrated, but this salt did not adjust itself to the composition predicted by the negative log factor. It is suggested that this may be due to a different crystal structure. When various amounts of this tricalcium phosphate were added to equilibrating mixtures which would normally form precipitates agreeing with the negative log factor, the precipitates failed to reach the appropriate composition. The degree of deviation depended upon the quantity of tricalcium phosphate added.

Equilibrium was reached in two days when the precipitate was formed from solution. Longer periods of time were required for precipitates added in the solid form to supernatant solutions. When fluoride was added to the salt mixtures, the composition of the precipitate agreed with that predicted by the negative log factor only when fluoride was substituted for carbonate in equivalent amounts. Analytical data for bone and plasma was available for different age groups, and substitution of this data into the equation resulted in a straight line relationship comparable to that obtained through the "in vitro" studies.

120 pages. \$1.50. MicA 55-1970

#### THE OXIDATION OF ALPHA-KETOGLUTARIC ACID BY METALLIC IONS

(Publication No. 12,915)

Joseph John Rackis, Ph.D.  
State University of Iowa, 1955

Chairman: Associate Professor George Kalnitsky

$\alpha$ -Ketoglutaric oxidase is a metallo-protein which requires magnesium or manganous ions for its activity. However, in the absence of the enzyme,  $Mn^{++}$  was capable of oxidizing  $\alpha$ -ketoglutaric acid ( $\alpha$ -KG) at an appreciable rate. This investigation was undertaken with the hope of gaining a better understanding of the nature of enzyme catalysis.

The oxidation of  $\alpha$ -KG can be catalyzed by  $Mn^{++}$ , and  $Co^{++}$ , in a veronal buffer pH 8.0 and 30° C., in air. Under similar conditions,  $Cu^{++}$ ,  $Ni^{++}$ , and  $Zn^{++}$  cannot catalyze this reaction. The optimum pH for  $Mn^{++}$  and  $Co^{++}$  oxidation was 8.0 and 7.7, respectively.

Carbon dioxide, succinic semi-aldehyde (SSA), succinic acid, malic acid, oxalic acid,  $\alpha$ -ketobutyric acid and acetic acid were identified as products. Oxalic acid was isolated as a manganese complex. The formation of ethyl alcohol was shown; however, the source of this compound is still in doubt.

During the initial phases of the oxidation with  $Mn^{++}$ , there was a lag period of five minutes, during which time no oxygen uptake was observed manometrically. Threonine had no effect on this lag. On the other hand, this lag was fifteen minutes for the  $Co^{++}$  system, which was extended to about thirty-five minutes in the presence of threonine. This lag was due to the formation of a metal-substrate complex and subsequent decarboxylation to SSA

before oxidation could occur. This was shown spectrophotometrically. An alternative pathway involved metal-substrate complex formation followed by oxidation to oxalic acid.

The  $O_2/\alpha$ -KG ratios observed during the  $Mn^{++}$  and  $Co^{++}$  catalyzed oxidation increased with time from an initial value of 0.2 to a final value of 1.0 and 0.79, respectively, after nearly complete oxidation of  $\alpha$ -KG. In the presence of threonine, the  $O_2/\alpha$ -KG ratios in the  $Mn^{++}$  system reached a value of unity very quickly and did not change significantly even after complete oxidation, whereas, in the  $Co^{++}$  system, threonine increased the ratio to 0.92. The  $O_2/\alpha$ -KG ratios were effected by pH. Therefore, the amount of oxygen utilization cannot be used as a measure of the amount of  $\alpha$ -KG oxidized.

The  $CO_2/\alpha$ -KG ratios, in the  $Mn^{++}$  system, increased with time from an initial value of 0.2 to 0.7 or 0.8 after complete oxidation. Within a two-hour period, threonine had no effect upon this ratio. Since the  $CO_2/\alpha$ -KG ratios were below unity, it indicated that  $\alpha$ -KG was also utilized by an alternative pathway which did not involve decarboxylation.

The rate of oxygen uptake observed during the  $Mn^{++}$  catalyzed oxidation can be accelerated 10-80 percent depending upon the amino acid employed, and similarly, will inhibit the  $Co^{++}$  oxidation by 40-84 percent. This applied to an oxidation period of two hours.

Threonine will accelerate the oxygen uptake by 79 percent. However,  $\alpha$ -KG utilization and carbon dioxide evolution were increased only 10-15 percent, using the  $Mn^{++}$  system. The other amino acids present a similar situation. Therefore, it appears that the amino acid exerted its effect on the oxidative phase of the reaction, and not on the initial decarboxylation. Threonine accelerated the  $Mn^{++}$  oxidation of succinic semi-aldehyde by 119 percent; however, this oxidation cannot account for the total oxygen uptake observed for the oxidation of  $\alpha$ -KG.

For a two-hour oxidation period, the isolated products can account for approximately 60 percent of the amount of  $\alpha$ -KG oxidized by  $Mn^{++}$ . In the presence of threonine, a 40 percent recovery was achieved.

The oxidation spectrum of  $\alpha$ -KG in the presence of  $Mn^{++}$  showed a disappearance of the absorption peak of  $\alpha$ -KG at 315  $m\mu$  and the appearance of an absorption peak at 273  $m\mu$  corresponding to SSA. Both maxima are pH dependent. Threonine will cause a shift of the absorption peak at 273  $m\mu$  to higher wavelengths.

$Mn^{++}$ , under the conditions employed, oxidized oxalacetic acid, SSA and  $\alpha$ -ketobutyric very readily. Pyruvic acid showed limited oxidation.

The presence of  $MnCl_2$  has no effect upon the titration curve of  $\alpha$ -KG.

113 pages. \$1.41. MicA 55-1971



THE SYNTHESIS OF ALPHA-ACETOLACTATE IN  
CRUDE AND PARTIALLY PURIFIED  
PROTEUS MORGANII EXTRACTS

(Publication No. 12,922)

Morey Eli Slodki, Ph.D.  
State University of Iowa, 1955

Chairman: Professor George Kalnitsky

Cell-free extracts of the bacterium *Proteus morganii* catalyze the diphosphothiamine (DPT)- $Mg^{++}$ -dependent formation of alpha-acetolactic acid from pyruvic acid. This system differs from those described for other microorganisms in that acetolactic decarboxylase activity could not be detected throughout the pH range of 5.5 to 8.2. The acetolactate formed in the presence of *P. morganii* extracts can be decarboxylated to acetoin by the specific acetolactic decarboxylase of *Aerobacter aerogenes* and has thereby been shown to consist of a single stereochemical species.

Partial purification of the acetolactate-forming enzyme has been achieved by means of adsorption and elution from alumina and calcium phosphate gel and by ammonium sulfate precipitation. These procedures were attended by large losses in enzymatic activity. Higher than four-fold purification could not be attained due to the instability of the enzyme system under the conditions employed.

The *P. morganii* system has also been found to differ in the pH optimum of acetolactate formation. Dialyzed crude preparations display optimal activity at pH 8.5, but little activity at pH 6.0. Upon purification a shift in pH optimum is observed to pH 7.5-7.8 along with considerable broadening of the pH-activity curve. In addition, partially purified, but not crude preparations also catalyzed the direct formation of acetoin from pyruvate and acetaldehyde. Since this activity does not compete with acetolactate formation from pyruvate, the simultaneous existence in these preparations of two different acyloin-forming systems is implicated. Acetaldehyde alone does not form acetoin. Both crude and partially purified enzymes display substrate saturation at a pyruvate concentration of about  $5 \times 10^{-2}$  M. While DPT can readily be removed by dialysis, complete resolution of enzyme preparations with respect to  $Mg^{++}$  could not be achieved.

Coenzyme A ( $1 \times 10^{-4}$  M) exerts a marked stimulatory effect on dialyzed crude preparations. No activity is observed in the presence of CoA when DPT is absent. Other sulfhydryl compounds (L-cysteine, thiomalic acid, and glutathione) stimulate acetolactate synthesis at concentrations of  $2 - 5 \times 10^{-3}$  M, but inhibit at higher concentrations. L-cystine is inhibitory even at lower concentrations. No effect with CoA was obtained when using partially purified preparations.

Under conditions of incomplete substrate utilization acetolactate formation and carbon dioxide evolution do not account for all of the pyruvate dissimilated. Complete conversion of pyruvate to acetolactate is observed under conditions of complete substrate utilization. *P. morganii* preparations also catalyze the formation of pyruvate from synthetic acetolactate.

Oxalacetic acid is anaerobically decarboxylated in the presence of DPT and  $Mg^{++}$  fortified crude *P. morganii* extracts without the concomitant formation of either pyruvate or acetolactate. These extracts also catalyze the anaerobic decarboxylation of alpha-ketoglutaric and

alpha-ketobutyric acids. The latter activity does not result in acyloin formation. A preliminary attempt to investigate the cofactor requirements of these reactions implicated the participation of both  $Mg^{++}$  and DPT.

74 pages. \$1.00. MicA 55-1972

INVESTIGATIONS INTO THE METABOLISM  
OF NICOTINIC ACID

(Publication No. 12,975)

Jan van Eys, Ph.D.  
Vanderbilt University, 1955

Supervisor: Dr. W. J. Darby

Since the literature on the etiology of pellagra and on the role of corn in producing niacin deficiency indicates the existence of a toxic factor in the grain, the demonstration of this factor was attempted. It was possible to repeat the findings described in Woolley's preliminary note (D. W. Woolley: *J. Biol. Chem.* 163, 773, (1946)) to the effect that an alkaline chloroform extract of whole corn, equivalent to 100 grams of corn per 100 grams of diet, inhibited the growth of mice fed an otherwise purified, adequate ration. This growth inhibition could be completely counteracted by incorporating 0.25 per cent nicotinamide, and partially counteracted by 1.6 per cent DL-tryptophane in the diet.

During the investigation of this phenomenon, a new metabolite of nicotinic acid was isolated from rat urine. The isolation was accomplished through lead salt fractionation, chromatography on a Dowex 50 column, and finally by paper chromatography. On the basis of alkaline and enzymatic hydrolyses the metabolite was assigned the structure  $\beta$ -nicotinoyl-D-glucuronic acid. The material was demonstrated to be a normal metabolite in rat urine, comprising 0.05 per cent of the total glucuronic acid excretion. Other species investigated (rabbit, dog, monkey and human) do not normally excrete the metabolite in their urine.

In an attempt to elucidate the role of quinolinic acid in the conversion of tryptophane to niacin, thiazole-4, 5-dicarboxylic acid was synthesized and tested for possible action as an antimetabolite of nicotinic and quinolinic acids. Thiazole-4, 5-dicarboxylic acid was inactive in influencing either the tryptophane or niacin nutriture of several bacterial species or rats. It was found to be relatively nontoxic. It did have an effect on the excretion of reduced ascorbic acid in the rat: 20 mgr./kg. body weight approximately doubled the excretion of ascorbic acid.

The chemistry of thiazole-4, 5-dicarboxylic acid and some of the properties of quinolinic acid are presented.  
149 pages. \$1.86. MicA 55-1973

## CHEMISTRY, INORGANIC

MECHANISM OF SUBSTITUTION REACTIONS  
OF VARIOUS COBALT(III) COMPLEXES

(Publication No. 13,068)

John Gregory Bergmann, Ph.D.  
Northwestern University, 1955

The rates of aquation and hydrolysis have been determined for a number of C-substituted acetatopentamminecobalt (III) ions. In these compounds, the steric hindrance on the front side of the molecule (the same side as the group being displaced) is allowed to vary. The reaction rates were shown to be dependent upon the basic strength of the coordinated ligand but independent of its size. On this basis, it is believed the incoming group does not approach the molecule from the front side. A study was conducted of the rates of aquation and hydrolysis of a series of compounds of the type,  $\text{trans-}[\text{Co}(\text{AA})_2\text{amineCl}]\text{Cl}_2$  where AA was ethylenediamine or propylenediamine. In these complexes, the steric hindrance of the back side of the molecule (the side opposite the displaced ligand) was altered, i.e. the size of the alkyl portion of the amine was changed. The results indicated that increased steric hindrance on the back side of the molecule does not decrease the reaction rate. Thus, it is concluded that the substituting species does not approach the molecule from the back side. On the basis of these results, it is concluded that the aquation and hydrolysis reactions of cobalt (III) complexes involve primarily a dissociation process.

The effect of the base strength of the coordinated ligand on reaction rate was investigated by determining the rates of aquation and hydrolysis of a series of compounds of the type,  $[\text{Coen}_2\text{X-pyCl}]\text{Cl}_2$  where X-py was pyridine, m-methyl pyridine, p-methyl pyridine and p-methoxy pyridine. These amines increase in base strength in the given order and by a factor of 13 from pyridine to p-methoxy pyridine. The rates of aquation of the complexes containing these amines were found to increase with increasing basic strength of the pyridine, but only slightly, indicating that the base strength of the coordinated pyridine has only a small effect on the cobalt-chlorine bond. The rates of hydrolysis of these compounds decrease as the base strength of the pyridines increase. These results can best be interpreted on the basis of an  $\text{S}_{\text{N}}1\text{CB}$  mechanism.

A detailed study was made of the reactions of the *cis* and *trans*- $[\text{Coen}_2\text{NO}_2\text{Cl}]^+$  and  $[\text{Coen}_2\text{NO}_2\text{H}_2\text{O}]^{+2}$  ions with nitrite, azide and thiocyanate ions in aqueous media. Reaction of the chloronitro complexes with these ions to form the corresponding substituted compounds were shown to be independent of the concentration of the substituting species and, furthermore, the rates of chloride formation in the presence of varying amounts of these ions were identical to the rate of aquation of the chloronitro complexes. Thus, it was demonstrated that these reactions proceed through an intermediate aquation step.

Reaction of the *cis*-aquonitro complex with azide and thiocyanate ions was studied but ion-pair formation was shown to exist between the complex and these ions. As a result, no conclusion could be drawn concerning the mechanism of the reaction between the *cis*-aquonitro complex and azide and thiocyanate ions.

A close examination of the reaction between the *cis*-aquonitro complex and nitrite ion to form the *cis*-dinitro

compound revealed that in weakly acidic solutions the *cis*-nitritonitro complex was formed as a reaction intermediate. The *cis*-nitritonitro is probably formed by nitrosation with presumably  $\text{N}_2\text{O}_3$ . This mechanism does not involve the breaking of the Co-O bond. The rearrangement of the *cis*-nitritonitro intermediate to the *cis*-dinitro form was shown to be independent of the nitrite ion concentration suggesting that an intramolecular process is involved. Reaction of the *cis*-chloronitro complex with nitrite ion in anhydrous ethylene glycol was found to proceed directly with no nitritonitro intermediate. 111 pages. \$1.39. MicA 55-1974

## CHEMISTRY, ORGANIC

SYNTHETIC AND POLYMERIZATION  
MECHANISM STUDIES OF  
UNSATURATED QUATERNARY AMMONIUM SALTS

(Publication No. 12,764)

Rudolph John Angelo, Ph.D.  
The University of Florida, 1955

A series of unsaturated tertiary diamines of the type  $(\text{CH}_2=\text{CHCH}_2)_2\text{N}(\text{CH}_2)_n\text{N}(\text{CH}_2\text{CH}=\text{CH}_2)_2$  was prepared and characterized. For those compounds where  $n = 2, 3$  or  $6-10$ , acceptable yields were obtained by the reaction of the corresponding 1,n-dihalo or di(arylsulfonyl)alkane with diallyl amine. This method was unsuccessful for those compounds where  $n = 4$  and  $5$ ; in the presence of an excess of diallyl amine, the products of reaction were allyl pyrrolidine and triallyl amine from the 1,4-derivatives, and allyl piperidine and triallyl amine from the 1,5-derivatives. The products of the reaction were explained on the basis of an intramolecular cyclization to the five or six membered cyclic quaternary ammonium salt, followed by allylation of the excess diallyl amine by the quaternary ammonium salt to produce triallyl amine and the appropriate allyl substituted heterocyclic amine. The reaction products were identified by chemical means and by infrared spectral analysis. The desired 1,4 and 1,5 tertiary diamines were obtained by the reduction of the corresponding amides with lithium aluminum hydride.

The methyl and the allyl quaternary ammonium derivatives of the tertiary diamines were prepared in good yields.

A modified suspension polymerization was used to polymerize the quaternary ammonium salts. Using t-butylhydroperoxide as an initiator and a mixture of water and mineral oil as a reaction medium, water-insoluble resins possessing anion exchange properties were obtained in good yields.

A rapid titration method of determining the exchange capacity of the resins was developed making use of a Beckman Model K automatic titrator. This method kept the time and the number of samples at a minimum. The exchange capacity was expressed as the fraction of theoretical exchange per hour; a maximum of exchange per unit time was observed at the pentamethylene derivatives of both the allyl and the methyl quaternary polymer series. There was no definite correlation between the swelling



coefficient and the exchange capacity of the resins.

A study of the polymerization mechanism of allyl quaternary ammonium derivatives did not result in any definite evidence as to structural configuration of the polymers. Synthetic variations of monomer structure, degradation studies, chemical and infrared analyses, and attempted molecular weight determinations were used to investigate the polymerization. It is believed that a considerable amount of cyclic intramolecular polymerization, greatly affected by chain termination caused by  $\alpha$ -hydrogen transfer, would account for the soluble, low molecular weight, unsaturated polymers obtained in this study.

118 pages. \$1.48. MicA 55-1975

PREPARATION OF P-AMINO BENZOYLGLYCYL  
DERIVATIVES OF 2-AMINOPYRIMIDINE,  
2-AMINOTHIAZOLE AND ANILINE.  
REPLACEMENT OF THE PYRAZINE RING  
IN PTEROIC ACID BY THE IMIDAZOLE RING.

(Publication No. 12,675)

Chao-Shing Cheng, Ph.D.  
Temple University, 1955

Certain analogues of sulfadiazine, sulfathiazole, and acetanilide were prepared by replacing the p-aminobenzenesulfonyl and acetyl groups with the p-nitrobenzoylglycyl group and subjecting these nitro compounds to reduction. These heterocycles might have anti-bacteria action and the aniline derivative might be a useful antipyretic.

The acid chloride was prepared by the action of phosphorus pentachloride on p-nitrobenzoylglycine suspended in acetyl chloride. A yield of 60.6% was obtained, m.p. 116°. P-nitrobenzoylglycyl-2-amidopyrimidine was obtained in 48.0% yield from the acid chloride and the amino compound. It contained one molecule of water of crystallization and melted at 164.5-166°.

Reduction of p-nitrobenzoylglycyl-2-amidopyrimidine was accomplished by using ferrous sulfate and aqueous ammonia. P-aminobenzoylglycyl-2-amidopyrimidine dihydrate in yellow crystals was obtained in 32.5% yield; it melted at 123-125°.

P-nitrobenzoylglycyl-2-amidothiazole was obtained as white crystals in 37.6% yield; it melted at 271-273° with decomposition. The amino compound was obtained by hydrolyzing its acetyl derivative which was prepared by treating the nitro compound with zinc dust and acetic acid. The acetyl derivative was obtained in 47.5% yield; it melted at 255-258° with decomposition. The amino compound was obtained from the acetyl derivative in 72.7% yield; it melted at 248-249° and decomposed at 252°. The amino compound was also obtained in 17.1% yield by reducing the nitro compound with a suspension of stannous chloride in ethanol.

P-nitrobenzoylglycylanilide was prepared in 52.6% yield; it sintered at 171-175° and melted at 196°. It was reduced to the amino compound by zinc dust and acetic acid in 61.1% yield without formation of the acetyl derivative as in the case of its thiazole analogue; it sintered at 224° and melted at 253-254°.

Attempts to prepare the p-nitrobenzoylglycine ester of  $\beta$ -diethylaminoethanol from p-nitrobenzoylglycyl chloride

and the alkamine or by reacting the p-nitrobenzoylglycine ester of  $\beta$ -chloroethanol with excess diethylamine were unsuccessful. Direct esterification of diethylaminoethanol by p-nitrobenzoylglycine under the influence of hydrogen chloride gas also failed.

The p-nitrobenzoylglycine ester of  $\beta$ -chloroethanol was prepared in 87.4% yield by reacting ethylene chlorohydrin with p-nitrobenzoylglycyl chloride; it melted at 130-131.5°.

Efforts were made to replace the pyrazine ring in pterioic acid with an imidazole ring.

Preparation of p-N-(2,4-diamino-6-hydroxy-5-pyrimidinylacetamido)-aminobenzoic acid hemi-hydrate (IV) was effected by reacting 2,4-diamino-6-hydroxy-5-chloroacetamidopyrimidine with p-aminobenzoic acid in a yield of 51.6%; it did not melt but charred at 360°.

Ring closure of IV to give p-N-(2-amino-6-hydroxy-8-purinemethyl)-aminobenzoic acid (X) was accomplished by heating (IV) with concentrated sulfuric acid at 100°, which gave a sulfate of the desired compound containing two molecules of water. When this sulfate was treated with boiling dimethylformamide, IV was obtained. When it was treated under milder conditions - dissolved in 0.5 N sodium hydroxide and precipitated by 0.5 N hydrochloric acid - the desired compound (X) was obtained, which melted at 315-317° with decomposition. 58 pages. \$1.00. MicA 55-1976

THE REACTION OF p-XYLENE AND MALEIC  
ANHYDRIDE IN THE PRESENCE OF  
ALUMINUM CHLORIDE

(Publication No. 12,698)

Joseph Wilfred Collins, Ph.D.  
Syracuse University, 1955

It has been established by an independent synthesis that 3-oxo-4,7-dimethylindane-1-carboxylic acid is the product obtained when p-xylene is allowed to react at 60°C with maleic anhydride in the presence of aluminum chloride. It had been reported previously<sup>1</sup> that this product was a geometrical isomer of  $\beta$ -2,5-dimethylbenzoylacrylic acid which is the expected product obtained at room temperature, but all attempts to confirm that the two reaction products were cis and trans isomers were unsuccessful.

The synthesis of 3-oxo-4,7-dimethylindane-1-carboxylic acid was accomplished in the following manner. p-Xylene was brominated to give 2-bromo-1,4-dimethylbenzene which was converted to 2,5-dimethylbenzaldehyde by the Grignard-orthoformate method.<sup>2</sup> Condensation of sodium cyanoacetate with the aldehyde and esterification of the product, followed by addition of hydrogen cyanide and hydrolysis produced 2,5-dimethylphenylsuccinic acid. Upon treatment with thionyl chloride and aluminum chloride the acid cyclized to 3-oxo-4,7-dimethylindane-1-carboxylic acid. Samples of this acid and the so-called "trans" isomer had identical melting points and mixed melting point.

Further proof of the identity of the "trans" compound was obtained by preparing the methyl and phenacyl esters and the 2,4-dinitrophenylhydrazones of both compounds. All derivatives had identical melting points and mixed melting points.

The work of Baddeley<sup>3</sup> who had prepared various 3-oxo-indanecarboxylic acids (including the 4,7-dimethyl isomer) by cyclization of the corresponding  $\beta$ -aroylacrylic acids in

molten aluminum chloride-sodium chloride was confirmed by cyclizing a sample of  $\beta$ -2,5-dimethylbenzoylacrylic acid to 3-oxo-4,7-dimethylindane-1-carboxylic acid.

In a discussion of the probable mechanism of this cyclization, Baddeley postulated that because of the "ortho" effect the di-, tri-, and tetra-methyl benzoylacrylic acids undergo the reaction and the mono-methyl and unsubstituted benzoylacrylic acids do not. However Baddeley has shown that  $\beta$ -3,4-dimethyl benzoylacrylic acid can be cyclized as easily as the 2,5- or 2,4- isomers, and yet the former compound contains no group ortho to the keto group. It is therefore suggested that since the "ortho" effect cannot be used to explain cyclization in this case, the inductive effect of two or more methyl groups is sufficient to explain the cyclization in all cases.

In the initial efforts to verify that the two compounds were cis-trans isomers, several new compounds were obtained. One of these was 4,7-dimethylindane-1-carboxylic acid, prepared by Clemmensen reduction of 3-oxo-4,7-dimethylindane-1-carboxylic acid. A new and unusual derivative, 2-(4,7-dimethyl-1-indanyl)-benzimidazole, was obtained from this compound by treatment with o-phenylenediamine.

Handler<sup>1</sup> had reported interconversion of the "cis" and "trans" compounds when they were dissolved in suitable solvents and exposed to ultraviolet light. In repeating this work it was found that the "cis" compound which is  $\beta$ -2,5-dimethylbenzoylacrylic acid did isomerize as might be expected<sup>5</sup> while the "trans" compound, now established as 3-oxo-4,7-dimethylindane-1-carboxylic acid, was unaffected by the irradiation. 80 pages. \$1.00. MicA 55-1977

1. Handler, Dissertation, Syracuse University (1948).

2. Smith and Nichols, *J. Org. Chem.*, **6**, 489 (1941).

3. The work of Baddeley and Lambert and Martin<sup>4</sup> was noted only after most of the research reported in this thesis was completed.

a. Baddeley, Holt and Makar, *J. Chem. Soc.*, 1952, 3289; b. Baddeley, Holt, Makar and Ivinson, *ibid.*, 1953, 3605; c. Baddeley, Makar and Ivinson, *ibid.*, 1953, 3969.

4. Lambert and Martin, *Bull. Soc. Chim. Belges*, **61**, 132 (1952); **47**, 2158 (1953)

5. See, for instance, Lutz and Scott, *J. Org. Chem.*, **13**, 284 (1948).

#### THE SYNTHESIS OF AZACYCLOHEPTANE DERIVATIVES RELATED TO PIPERIDINE ANALGESICS. II.

(Publication No. 12,677)

Julius Diamond, Ph.D.  
Temple University, 1955

In the search for a new type of potent analgesic, the synthesis of dl-4-phenyl-4-carbethoxy-1-methylazacycloheptane, the seven-membered ring analog of the piperidine analgesic Demerol, was undertaken and first reported in 1952.

The analgesic effectiveness of the seven-membered

ring compound was demonstrated in clinical studies; no evidence of addiction liability was reported. These results stimulated further interest in the pharmacological study of large ring compounds related to known piperidine analgesics. Accordingly, the structure of dl-4-phenyl-4-carbethoxy-1-methylazacycloheptane was modified in order that the effect of these changes on analgesic activity and addiction liability might be evaluated.

As part of this study, the racemic base was resolved into its optical antipodes. dl-4-Phenyl-4-carbethoxy-1-methylazacycloheptane was converted to a mixture of two diastereoisomeric l-menthyl esters by transesterification with l-menthol. The diastereoisomeric l-menthyl esters were separated by fractional crystallization of their hydrochlorides, and then reconverted to their corresponding ethyl esters. The latter compounds proved to be enantiomorphic isomers.

Several compounds were synthesized in which the aryl group of dl-4-phenyl-4-carbethoxy-1-methylazacycloheptane, and its ethyl ketone derivatives, was altered. These included 4-(m-hydroxyphenyl)-4-propionyl-1-methylazacycloheptane, the seven-membered ring analog of the piperidine analgesic ketobemidone. 4-( $\alpha$ -Thienyl)-4-carbethoxy-1-methylazacycloheptane, 4-(p-nitrophenyl)-4-carbethoxy-1-methylazacycloheptane, and 4-(p-aminophenyl)-4-carbethoxy-1-methylazacycloheptane were also prepared.

A number of C-methyl homologs related to 4-phenyl-4-carbethoxy-1-methylazacycloheptane were synthesized in which an additional C-methyl group was incorporated at ring atoms 2,3,5, and 7. Although two diastereoisomeric forms are theoretically possible for each of these 1,C-dimethylazacycloheptane derivatives, only in the 1,2-dimethylazacycloheptane series were both forms isolated and their structures proved. Another type of homolog was obtained by including the additional C-methylene group in the ring structure of the parent compound; this was 4-phenyl-4-carbethoxy-1-methylazacycloheptane, the eight-membered ring analog of Demerol.

Several compounds related to 4-phenyl-4-carbethoxy-1-methylazacycloheptane, and its 3-methyl homolog, were prepared in which the 4-carbalkoxy group was reversed to a 4-acyloxy group. The simplest member of the 4-acyloxy series, 4-phenyl-4-acetoxy-1-methylazacycloheptane, was obtained by three alternative methods. 4-Phenyl-4-propionoxy-1,3-dimethylazacycloheptane, the seven-membered ring analog of the piperidine analgesic Nisentil, was also synthesized, and its structure proved.

Two isomeric 4-phenyl-1-methylazacycloheptenes were formed unexpectedly by the reaction of 4-phenyl-4-benzoyl-1-methylazacycloheptane with phenyl lithium, and by the thermal decomposition of 4-phenyl-4-ethylsulfonyl-1-methylazacycloheptane methochloride.

Several derivatives of 4-phenyl-4-carbethoxy-1-methylazacycloheptane, prepared in the course of this work, were found to possess considerable analgesic activity. In particular,  $\alpha$ -4-phenyl-4-carbomethoxy-1,2-dimethylazacycloheptane,  $\alpha$ -4-phenyl-4-carbethoxy-1,2-dimethylazacycloheptane, and 4-phenyl-4-carbethoxy-1,3-dimethylazacycloheptane were reported to be several times more potent than the parent compound. 194 pages. \$2.43. MicA 55-1978



## ISOFLAVONES: METHYLGENISTEIN

(Publication No. 12,900)

Paul Steven Hudson, Ph.D.  
State University of Iowa, 1955

Chairman: Professor R. L. Shriner

The purpose of this investigation was to study the synthesis of methylgenistein (5,7,4'-trihydroxy-8-methylisoflavone), one of the isoflavones reported in soybeans, and to resolve the conflicting data concerning the melting points of the final product and several intermediates. An attempt was made to isolate methylgenistein from soybeans so the synthetic compound could be compared with the naturally occurring material.

The synthesis was studied by preparing the methylphloroglucinol starting material by two methods. The methylphloroglucinol from each method was independently subjected to the same sequence of reactions to yield methylgenistein. The intermediates from both synthetic sequences were alike in melting point, and no depression of melting point was noted when two corresponding intermediates were mixed. Methylgenistein was found to be dimorphic and melted at two temperatures, depending upon its crystalline modification.

Methylphloroglucinol was prepared by two methods:

(a) The condensation of phloroglucinol with formaldehyde gave 2,2',4,4',6,6'-hexahydroxydiphenylmethane. This compound was cleaved with zinc dust and sodium hydroxide solution to yield phloroglucinol and the product, methylphloroglucinol.

(b) The catalytic hydrogenation of trinitrotoluene gave triaminotoluene which was hydrolyzed to methylphloroglucinol.

The methylphloroglucinol was treated with methanol in the presence of hydrogen chloride to give 2,6-dihydroxy-4-methoxytoluene.

Homoanisonitrile was obtained from anisaldehyde through catalytic hydrogenation to anisyl alcohol, conversion of the alcohol to anisyl chloride with hydrogen chloride, and formation of the nitrile from anisyl chloride by the use of potassium cyanide.

2-Methoxy-4,6-dihydroxy-5-methyl- $\alpha$ -p-methoxyphenylacetophenone was prepared by the condensation of homoanisonitrile with 2,6-dihydroxy-4-methoxytoluene, and this ketone was cyclized with ethyl orthoformate to give 4',5-dimethoxy-7-hydroxy-8-methylisoflavone.

Methylgenistein was obtained when the above methylgenistein dimethyl ether was cleaved with hydriodic acid.

The isoflavones isolated from soybeans were genistein (5,7,4'-trihydroxyisoflavone) and daidzein (7,4'-dihydroxyisoflavone). Isogenistein (5,7,2'-trihydroxyisoflavone), methylgenistein (5,7,4'-trihydroxy-8-methylisoflavone), methylisogenistein (5,7,2'-trihydroxy-8-methylisoflavone), and tatroin (5,4'-dihydroxy-8-methylisoflavone), reported in soybeans by Okano and Beppu, were not found.

78 pages. \$1.00. MicA 55-1979

APPLICATION OF RING ENLARGEMENT REACTIONS  
WITH DIAZOALKANES TO SYNTHESIS  
IN THE COLCHICINE FIELD

(Publication No. 12,802)

Herbert Edmond Johnson, Ph.D.  
Washington University, 1955

Chairman: C. David Gutsche

A study has been made of the ring enlargement of cyclohexanone in methanol with several ethyl N-nitroso-N-benzylcarbamates carrying methyl and methoxyl substituents on the phenyl nucleus. The ratio of Ar CH<sub>2</sub>OCH<sub>3</sub> to 2-arylcycloheptanone formed increases in the following order of Ar: phenyl  $\approx$  m-methoxyphenyl < o-methylphenyl < p-methylphenyl o-methoxyphenyl < p-methoxyphenyl < 2,3,4-trimethoxyphenyl  $\approx$  2,4,6-trimethylphenyl. A mechanism is proposed which accommodates the substituent effect as well as other features of the reaction.

In an attempt to synthesize octahydrodemethoxydeoxy-desacteamidocolchicine the cyclodehydration of 2-[ $\gamma$ -(2',3',4'-trimethoxyphenyl)-propyl]-cycloheptanone was investigated. None of the desired product was obtained, and the cyclodehydration of 2-( $\gamma$ -phenylpropyl)-cycloheptanone was therefore studied in an attempt to determine the nature of the cyclodehydration products. The major product of this reaction is believed to be 1,7b-pentamethylene-7b,1a,2,3-tetrahydro-1-cyclopropa[a]naphthalene. Proof of structure rests on evidence from ultraviolet and infrared spectra considerations, hydrogenation experiments, dehydrogenation experiments, and the fact that 2-( $\beta$ -phenylethyl)-cyclooctanone upon cyclodehydration gives a similar product. It is suggested that a similar product is also obtained upon cyclodehydration of 2-[ $\gamma$ -(2',3',4'-trimethoxyphenyl)-propyl]-cycloheptanone.

A new method for the preparation of fused tricyclic ring compounds containing a cycloheptatriene ring was investigated. 2-( $\beta$ -Phenylethyl)-phenyldiazomethane was prepared by oxidation of the hydrazone of 2-( $\beta$ -phenylethyl)-benzaldehyde and cyclized to give 2-phenylindane (30%) and 6,6a-dihydro-5-H-cyclohepta[a]naphthalene (10%). The 2-phenylindane was characterized by comparison with an authentic sample, identical diacetyl derivatives being obtained from the two materials. The structure of the naphthalene was established by hydrogenation to 6,6a,7,8,9,10,11,11a-octahydro-5H-cyclohepta[a]naphthalene followed by dehydrogenation to 8,9,10,11-tetrahydro-7H-cyclohepta[a]naphthalene. The latter compound was also prepared by an unequivocal route. In an attempt to extend the reaction to a colchicine synthesis, 2,3,4-trimethoxy-6-[ $\gamma$ -(4'-methoxyphenyl)-propyl]-benzaldehyde was prepared and converted to its hydrazone. Attempts to oxidize the hydrazone to the diazo compound, however, were unsuccessful.

245 pages. \$3.06. MicA 55-1980

## PYROLYSIS OF DISUBSTITUTED AMIDES

(Publication No. 12,705)

Carlo Nocka, Ph.D.  
Syracuse University, 1955

An unsuccessful attempt some years ago to arrest a Curtius reaction by means of triphenylmethyl radicals depended upon the formation of a disubstituted amide of the structure,  $R-\overset{\text{O}}{\underset{\text{O}}{\text{C}}}-N(C\phi_3)_2$ . Since this complex amide may have been unstable under the conditions of the Curtius reaction, it was of interest to prepare compounds of this type and study their pyrolytic behavior. Therefore, in this investigation, the following N,N-disubstituted benzamides were synthesized and pyrolyzed at temperatures from 280° to 650° C.: N,N-dibenzylbenzamide, N,N-diphenylbenzamide, N-benzhydrylbenzanilide, and N-benzyl-N-benzhydrylbenzamide.

N,N-Dibenzylbenzamide at 430-515° broke down to benzonitrile, toluene, benzaldehyde, and stilbene (trace). A mechanism involving a cyclic intermediate is suggested to explain the formation of these products.

N-Benzhydrylbenzanilide when heated to 320-360° yielded benzoic acid, diphenylmethane, benzanilide, and 9-phenylacridine. Free radical mechanisms are offered to account for these products. The formation of benzoic acid can be explained by the oxidation of benzaldehyde, an expected pyrolysis product.

In the temperature range of 312-400°, N-benzyl-N-benzhydrylbenzamide pyrolyzed to benzoic acid, diphenylmethane, and a nitrogen-containing compound that may be 2,4,5-triphenylimidazole. An intermediate O-ether is suggested for the pyrolysis of this amide in order to arrive at diphenylmethane and benzoic acid (via benzaldehyde, as before). Although there is good evidence at hand for 2,4,5-triphenylimidazole, a simple and direct mechanism for its formation in this pyrolysis is lacking.

N,N-Diphenylbenzamide was found to be quite refractory to heat, distilling at atmospheric pressure practically unchanged in the temperature range of 430-440°. Subjecting vapors of the amide to temperatures of the order of 650°, however, effected a rapid conversion to diphenylamine and what may have been traces of benzonitrile and a quinoline-like product. However, considerable amounts of N,N-diphenylbenzamide escaped decomposition even under these severe conditions.

Numerous attempts were made to prepare N-tritylbenzanilide, all of which failed. Evidence was obtained, however, to indicate that the amide formed momentarily and immediately decomposed under the conditions of the benzoylation, yielding benzanilide and triphenylcarbinol.

The vapor-pressure-temperature relationship was determined for each of the disubstituted amide prepared in this study in order to arrive at the lowest possible pyrolysis temperature. Secondary reactions and formation of tars and otherwise unidentifiable substances can be minimized by conducting the pyrolysis at a low temperature.

186 pages. \$2.33. MicA 55-1981

## SUBSTITUTED PHENYLQUINOLINES

(Publication No. 12,849)

Robert Milton Summers, Ph.D.  
Indiana University, 1955

A number of substituted phenylquinolines were prepared for use in the synthesis of potentially new antimalarial compounds. 6-Phenyl-, 7-phenyl-, and substituted 7-phenyl-4-chloroquinolines were prepared from 4- and 3-aminobiphenyl and substituted 3-aminobiphenyls using the ethyl ethoxalylacetate modification of the Conrad-Limpach procedure.

The aminobiphenyls were prepared from the corresponding nitrobiphenyls by low pressure hydrogenation over Raney nickel. 3-Nitro-, 4-chloro-3'-nitro-, and 4-bromo-3'-nitrobiphenyl were prepared by methods previously given in the literature. 2-Chloro-3'-nitrobiphenyl, m.p. 64.5-65°, was obtained in 8.1% yield by the decomposition of 3-nitrobenzenediazonium chloride in chlorobenzene.

3-Aminobiphenyl refluxed with ethyl ethoxalylacetate in chloroform gave ethyl  $\beta$ -carbethoxy- $\beta$ -(3-phenylanilino)-acrylate (quantitative yields). Thermal cyclization in diphenyl ether at 255° C. gave 2-carbethoxy-4-hydroxy-7-phenylquinoline, m.p. 206.5-208°, in 58% yield. Hydrolysis of this ester with 2% sodium hydroxide gave, after neutralization with dilute hydrochloric acid, 2-carboxy-4-hydroxy-7-phenylquinoline, m.p. 262-263° (decomp.). Decarboxylation in diphenyl ether gave 4-hydroxy-7-phenylquinoline, m.p. 267-268° in 66.4% yield. Refluxing the 4-hydroxy compound with excess phosphoryl chloride gave 4-chloro-7-phenylquinoline, m.p. 89.8-90.2° in 94% yield. Using the same procedure the following compounds were prepared: Ethyl  $\beta$ -carbethoxy- $\beta$ -(4-phenylanilino)-acrylate, oil, (quant.); ethyl  $\beta$ -carbethoxy- $\beta$ -[3-(4-chlorophenyl)-anilino]-acrylate, oil, (quant.); ethyl  $\beta$ -carbethoxy- $\beta$ -[3-(2-chlorophenyl)-anilino]-acrylate, oil, (quant.); and ethyl  $\beta$ -carbethoxy- $\beta$ -[3-(4-bromophenyl)-anilino]-acrylate, oil, (quant.). Ring closure gave: 2-Carbethoxy-4-hydroxy-6-phenylquinoline, m.p. 228-230°, (68); 2-carbethoxy-4-hydroxy-7-(4-chlorophenyl)-quinoline, m.p. 263-264°, (74); 2-carbethoxy-4-hydroxy-7-(2-chlorophenyl)quinoline, m.p. 230.5-231.5°, (65.7); and 2-carbethoxy-4-hydroxy-7-(4-bromophenyl)quinoline, m.p. 262-264°, (83). Hydrolysis of the corresponding esters gave 2-carboxy-4-hydroxy-6-phenylquinoline, m.p. 260° (99); 2-carboxy-4-hydroxy-7-(4-chlorophenyl)quinoline, m.p. 274.5-275.5°, (99); 2-carboxy-4-hydroxy-7-(2-chlorophenyl)quinoline, m.p. 262-263°, (95); and 2-carboxy-4-hydroxy-7-(4-bromophenyl)quinoline, m.p. 279-280°, (100). Decarboxylation gave 4-hydroxy-6-phenylquinoline, m.p. 282.5-283.2°, (95); 4-hydroxy-7-(4-chlorophenyl)quinoline, m.p. 293-295.5° (100); 4-hydroxy-7-(2-chlorophenyl)quinoline, m.p. 224-226° (100); and 4-hydroxy-7-(4-bromophenyl)quinoline, m.p. 295-298°, (97.7). Reaction with phosphoryl chloride gave 4-chloro-6-phenylquinoline, m.p. 90-90.5°, (84); 4-chloro-7-(4-chlorophenyl)quinoline, m.p. 130-131°, (88.2); 4-chloro-7-(2-chlorophenyl)quinoline, m.p. (a) 94.3-95° (b) 102.5-103°, (83); and 4-chloro-7-(4-bromophenyl)quinoline, m.p. 134.2-135.2° (82.3). The figures given in parenthesis following the m.p.'s refer to the yields obtained.

Hydrogenolysis in alcohol of the 4-chloro derivatives over palladium on charcoal catalyst in the presence of an equivalent amount of fused sodium acetate gave the following quinolines; 6-phenyl-, m.p. 110-111°, (72.5); 7-phenyl-,



m.p. 57-58° (23); 7-(4-chlorophenyl)-, m.p. 99-100°, (62.5); 7-(2-chlorophenyl)-, oil, (68.5); and 7-(4-bromophenyl) quinoline, m.p. 106.5-107.5, (41). The Skraup reaction on 4-aminobiphenyl, 3-aminobiphenyl, and 3-amino-4'-bromobiphenyl gave respectively 6-phenylquinoline, m.p. 110° (53); 7-phenylquinoline, m.p. 57-58°, (23); and 7-(4-bromophenyl) quinoline, m.p. 107-109°, (14). In both the Conrad-Limpach and Skraup synthesis none of the 5-isomer was detected.

Heating 6-phenyl-4-chloroquinoline with 2-amino-5-diethylaminopentane at 165-185° for 24 hours then 195-200° for 1 hour gave the expected 6-phenyl-4-(4-diethylamino-1-methylbutylamino)quinoline, m.p. 115-116°, (54).

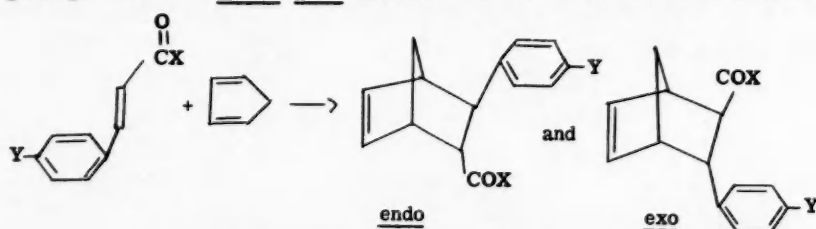
99 pages. \$1.24. MicA 55-1982

THE STEREOCHEMISTRY OF THE DIELS-ALDER REACTION BETWEEN CYCLOPENTADIENE AND SUBSTITUTED *trans*-CINNAMIC ACID DERIVATIVES. THE FORMATION OF NORTRICYCLENES DERIVATIVES IN BROMINATIONS OF *exo*-2,5-METHYLENE-1,2,5,6-TETRAHYDRO-BENZOIC ACIDS.

(Publication No. 12,662)

Charles Depew Ver Nooy, III, Ph.D.  
University of Michigan, 1955

The purpose of this investigation is to study the stereochemistry of the Diels-Alder reaction of cyclopentadiene and *trans*-cinnamic acid derivatives with a view of determining the effect of varying the dienophile "activating groups" on the *endo*-*exo* isomer ratio in the adduct mixture.



In the Diels-Alder study, the relative percentage of *endo* and *exo*-adducts formed during the reaction was determined by the formation of an insoluble iodolactone from the acidic derivatives of the *endo*-isomers, and by infrared analysis. With the aryl group of the dienophile constant, as the COX group was made more electron withdrawing by substitutions in the series,  $\text{CONH}_2 < \text{COOCH}_3 < \text{COOH} < \text{COCl}$ , a trend of increasing percentage of *endo*-isomer was found. Likewise, where the carboxyl group was constant, an increase in percentage of *endo*-isomer was found from *p*-methoxyphenyl to *p*-nitrophenyl in the series, *p*-methoxyphenyl > phenyl > *p*-chlorophenyl > *p*-nitrophenyl. However, only slight and, perhaps, insignificant differences were found among the first three members of the series.

It is reasonable to conclude from the observed trends that orientation of the activating group of a dienophile under the mobile electrons of the diene prior to reaction, and according to the "maximum accumulation of double bonds" rule, is favored by strong electron withdrawing groups. The attraction involved in the orientation of the reactants must be electronic in nature and its intensity and effectiveness in governing orientation is increased by the presence of greater electron density.

During the application of bromination as an analytical method in the Diels-Alder study, the expected bromolactone as well as other neutral products formed. An extended study of the bromination of derivatives of *exo*-2,5-methylene-1,2,5,6-tetrahydrobenzoic acids in bicarbonate solution showed that derivatives of 3-bromonortricyclene formed with the loss of the carboxylate group. In some cases, bromolactones resulting from a Wagner-Meerwein rearrangement also formed.

The iodolactonization reaction is stereospecific. A neutral iodolactone formed from the *endo*-carboxyl isomer whereas the *exo*-isomers were unchanged. This reaction coupled with the known reductive cleavage by zinc of the iodolactone products enabled the isolation of the pure stereoisomeric acids from the Diels-Alder reactions. The *exo*-carboxyl isomers cannot be isolated unchanged by a bromolactonization technique.

143 pages. \$1.79. MicA 55-1983

AN EXPERIMENTAL INVESTIGATION OF SOME MODELS FOR OPTICAL ACTIVITY

(Publication No. 11,959)

Marvin Howard Winkler, Ph.D.  
New York University, 1954

Adviser: Kurt M. Mislow

Karl F. Lindman, (Ann. Physik., (4) 74, 541 (1924), *ibid.* 77, 337 (1925), *ibid.* 38, 523 (1912), *ibid.* 63, 621 (1920), *ibid.* 69, 270 (1922)) had investigated the interaction of several different models with the plane of polarization of a beam of microwaves. He obtained data, which according to his interpretation, showed that his models affected plane polarized microwaves in a manner analogous to the way in which optically active molecules affect plane polarized light. These models have been generally accepted in the literature as valid models for optical activity. The present authors attempted to repeat Lindman's work as a prelude to extending his investigations to cover meso compounds.

Two microwave polarimeters were constructed in order to carry out this program, one a fixed frequency unit operating at 3 centimeters and one a tunable unit operating over a range of 10 to 20 centimeters. Curves which bore a strong resemblance to rotary dispersion curves were obtained for systems of copper helices using the tunable unit. Efforts to repeat Lindman's work on irregular tetrahedra however, were not successful. The "rotations" of these asymmetric models were found to be a function of the position of the model. Further investigation showed that a symmetrical unit placed asymmetrically was capable of giving the same results, indicating that no rotation of the plane of polarization is involved. An alternate theory based on the diffraction of a single sphere is offered to explain the data.

56 pages. \$1.00. MicA 55-1984

## CHEMISTRY, PHARMACEUTICAL

SIMPLE AMINES WHICH CONTAIN CYCLOHEPTYL,  
4-METHYLCYCLOHEPTYL, CYCLOOCTYL, 2-  
AND 4-PYRIDYL GROUPS

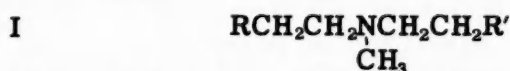
(Publication No. 12,540)

Juan Azuara Salas, Ph.D.  
University of Michigan, 1954

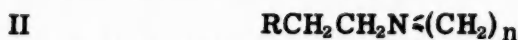
During this investigation, a number of analogs of the antispasmodic Cyverine, which is methyl-di( $\beta$ -cyclohexylethyl)-amine, were prepared in order that they might be tested for pharmacological activity.

These analogs represent amines in which one or both of the cyclohexyl groups in Cyverine were replaced by a seven- or eight-membered ring (cycloheptyl, 4-methylcycloheptyl or cyclooctyl) or by a heterocyclic radical (2- or 4-pyridyl). In some of the analogs, the  $\text{NCH}_3$  group of Cyverine was represented by a five-, six-, seven-, eight- or nine-membered nitrogenous ring, that is by a pyrrolidino, piperidino, 1-heptamethylenimino or 1-octamethylenimino group. In other analogs the methyl group, attached to the nitrogen in Cyverine, was replaced by cyclopentyl, cyclohexyl, cycloheptyl or cyclooctyl radicals.

All of the tertiary amines prepared can be represented by the three general formulas, I, II, III, shown below.



$\text{R}' = \text{cycloheptyl, 4-methylcycloheptyl, cyclooctyl, 2- or 4-pyridyl; R}' = \text{phenyl, cyclohexyl, 4-methylcyclohexyl, cycloheptyl, 4-methylcycloheptyl, 2- or 4-pyridyl.}$



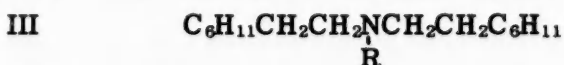
$\text{R} = \text{cycloheptyl, 4-methylcycloheptyl, cyclooctyl or 2-pyridyl; } n = 4, 5, 6, 7, 8.$

The synthesis of these compounds was accomplished by two different methods:

A. Direct alkylation of a secondary amine with a  $\beta$ -cycloalkylethyl bromide.

B. Interaction of a secondary amine with 2- or 4-vinylpyridine.

These methods were employed for the preparation of 17 tertiary amines of Type I and 16 of Type II.



$\text{R} = \text{cyclopentyl, cyclohexyl, cycloheptyl, or cyclooctyl.}$

These analogs were prepared by direct alkylation of the primary cycloalkylamines with  $\beta$ -cyclohexylethyl bromide. We prepared four tertiary amines of this type.

All the tertiary amines were submitted for pharmacological studies as their hydrochlorides and methobromides.

In addition to the tertiary amines mentioned above, a series of 13 secondary amines which contained cycloheptyl, 4-methylcycloheptyl, cyclooctyl, 2- or 4-pyridyl radicals were synthesized and submitted as their hydrochlorides for pharmacological evaluation.

A total of 50 secondary and tertiary amines were synthesized; as far as we are aware, 47 of these compounds have not been reported in the literature.

For the preparation of these amines, a large number of intermediates were required; nine of which represent new compounds.

93 pages. \$1.16. MicA 55-1985

EXTRACTION OF *Cinchona succirubra* PAVON  
et KLOTZSCH WITH TETRAHYDROFURAN  
AND ITS MIXTURES

(Publication No. 12,767)

Joseph Michael Campo, Ph.D.  
The University of Florida, 1955

This investigation is concerned with the extraction of *Cinchona succirubra* Pavon et Klotzsch with tetrahydrofuran and its mixtures for the purpose of establishing alkaloidal selectivity of the solvents employed. The solvents employed in this investigation were tetrahydrofuran, tetrahydrofuran-water azeotrope, tetrahydrofuran-chloroform azeotrope, and tetrahydrofuran-water solution (15 per cent water V/V). An azeotrope of benzene in tetrahydrofuran was prepared and its composition was determined by index of refraction measurements. This azeotrope was also employed in the extraction studies. The methods of extraction used as bases for this investigation were Soxhlet extraction, mechanical agitation, and a devised procedure combining both mechanical agitation and vacuum percolation by which the efficiency of the tetrahydrofuran-water solution could be determined. The data obtained by the quantitative extraction studies using these solvents and procedures is reported and discussed.

A study was made showing the relationship of time to per cent alkaloidal extraction. As a basis for this study Soxhlet extraction of the crude drug with tetrahydrofuran-water azeotrope was used.

A method has been described whereby cinchonine alkaloid can be isolated in reasonably pure form from a tetrahydrofuran-water azeotrope extract of the crude drug. The isolated alkaloid was identified by the following methods: (1) microscopic examination of crystalline form, (2) melting point and sublimation temperatures, (3) paper partition chromatography, (4) ultraviolet absorption spectrum, and (5) infrared absorption spectrum.

The alkaloidal selectivity of the tetrahydrofuran-water azeotrope for quinine and cinchonine alkaloids is reported and discussed.

54 pages. \$1.00. MicA 55-1986

## BASIC DIOXOLANES

(Publication No. 12,623)

Henry Edmond Millson, Jr., Ph.D.  
University of Michigan, 1954

1,3-Dioxolanes which had been prepared previously in this laboratory have been found to exhibit antispasmodic activity. This investigation was undertaken in order to provide a greater variety of dioxolanes for pharmacological study.

A total of forty-eight new salts of thirty new basic 1,3-dioxolanes was synthesized.

The 2-basically-substituted 1,3-dioxolanes were obtained by interaction of either bromoacetal or  $\beta$ -chloropropionaldehyde diethylacetal with hydrobenzoin, and then allowing the product, 2-bromomethyl-1,3-dioxolane or 2- $\beta$ -chloroethyl-1,3-dioxolane, to react with the required amine. Among the amines used were hexa-, 4-methylhexa-, hepta and octamethylenimine.



Reaction of 1-alky-4-piperidone diethylketal hydrochlorides with hydrobenzoin yielded 2,3-diphenyl-8-alkyl-1,4-diox-8-azaspiro(4.5)decane.

It was found that bromoacetal reacted with 1-hydroxymethylcyclohexanol to form 2-bromomethyl-1,3-dioxaspiro(4.5)-decane. Amination of this intermediate produced the 2 basically-substituted compounds.

Since considerable quantities of hexa-, hepta-, and octamethylenimine were available during this investigation, a series of N,N-polymethylenesulfamic acid was prepared in order that these products, in the form of their sodium salts, could be compared, with respect to sweetness, with sodium cyclohexylsulfamate (Sucaryl Sodium), an important commercial sweetening agent. None of the sodium N,N-polymethylenesulfamates was sweet. The sodium salt of N-cyclopentylsulfamic acid, the lower ring homolog of Sucaryl Sodium, which was prepared also, was found to be less sweet than the latter compound. The sulfamic acids were obtained by interaction of a polymethylenimine or cyclopentylamine with chlorosulfonic acid.

Recently, basic esters of 2,4-dichlorobenzoic acid have been described in the literature as local anesthetics. Since  $\beta$ -(1-hexamethylenimino)ethyl and  $\beta$ -(4-methyl-1-hexamethylenimino)ethyl 2,4-dichlorobenzoates had been prepared in this laboratory, it seemed desirable to prepare several additional esters of this type, namely  $\beta$ -(2-methyl-1-hexamethylenimino)-ethyl,  $\beta$ -(1-heptamethylenimino)ethyl and  $\beta$ -(1-octamethylenimino)ethyl 2,4-dichlorobenzoates.

75 pages. \$1.00. MicA 55-1987

#### QUANTITATIVE DETERMINATION OF SYMPATHOMIMETIC AMINES THROUGH THE USE OF ION EXCHANGE RESINS

(Publication No. 13,006)

Muriel Celeste Vincent, Ph.D.  
University of Washington, 1955

The sympathomimetic amines have been determined quantitatively by a number of different assay procedures; however, none of these was found applicable to all of the official sympathomimetic amines and their pharmaceutical preparations. Since the chemical nature of these compounds is such that they lend themselves to ion exchange, experiments were undertaken to develop a method which could be applied to all of the official sympathomimetic amines and their pharmaceutical products.

In the experimental work it was found that the strongly basic anion exchanger, Amberlite IRA-400, gave satisfactory results with all the amines except those containing phenolic groups. Quantitative results were obtained with d-amphetamine sulfate, dl-amphetamine sulfate, cyclopentamine hydrochloride, 1-ephedrine sulfate, d-methamphetamine hydrochloride, dl-methamphetamine hydrochloride, methoxyphenamine hydrochloride, methylhexanamine, naphazoline hydrochloride, phenylpropanolamine hydrochloride, phenylpropylmethylamine hydrochloride, racephedrine sulfate and tuaminoheptane sulfate. The phenolic amines were Aramine hydrogen tartrate, 1-epinephrine, hydroxyamphetamine hydrobromide, isopropylarterenol hydrochloride, and phenylephrine hydrochloride. Isopropylarterenol hydrochloride and 1-epinephrine

decomposed in the columns.

It was also found that the carboxylic cation exchanger, Amberlite IRC-50, could be used in the quantitative determination of these amines and their preparations providing no sodium ions or other basic interfering substances were present.

The weakly basic anion exchanger, Amberlite IR-45, was found to be suitable for the quantitative separation of all the amines used in this work including those containing phenolic groups. With proper buffering of the resin columns the method was applicable to those amines which are readily decomposed in the presence of light and alkali. The resin was also found to be satisfactory in the determination of the amines in the presence of sodium ions or other interfering substances.

In general the procedure is as follows. Twenty-five to 50 mg. of the amine salt was used in each determination or an equivalent amount of pharmaceutical preparation was taken. For the anion exchange resins the salt solution or pharmaceutical preparation was passed through the regenerated column, the column was rinsed with 50 or 75% ethyl alcohol solution to remove the amine base, and the filtrate thus obtained was titrated with standard acid using a pH meter or methyl red as indicator. With the cation exchange resin the solution of the amine salt or pharmaceutical preparation was passed through a regenerated column of resin, the column was rinsed free of the acidic portions of the compound, the amine base was removed with hydrochloric acid solution, and the filtrate thus obtained was titrated with a standard base solution.

Comparative data obtained with the ion exchange method employing Amberlite IR-45 and with the recognized methods indicated that the proposed method is comparable in accuracy to the other methods when applied to the pure sympathomimetic amines and is of greater accuracy than the recognized methods when applied to pharmaceutical products of the sympathomimetic amines.

64 pages. \$1.00. MicA 55-1988

#### A STUDY OF THE IVANOV REACTION

(Publication No. 12,673)

Harold Zinnes, Ph.D.  
University of Michigan, 1955

The object of this investigation was the study of the Ivanov reaction—a reaction in which a halomagnesium derivative of a salt of an arylacetic or a  $\beta,\gamma$ -unsaturated acid is employed—with the purpose of extending its scope. A second objective was the synthesis of basic esters of certain new acids prepared by the Ivanov reaction in order that they might be tested for antispasmodic activity.

In the General Introduction, a compilation of products which have been obtained by the use of the Ivanov reaction since 1950 has been presented.

Twenty-one new Ivanov reactions were carried out; in eighteen of these reactions an Ivanov reagent, the chloromagnesium derivative of the chloromagnesium salt of phenylacetic acid, was allowed to react with one of the following compounds: cyclopentanecarboxaldehyde, 1-cyclopentane-1-carboxaldehyde, cyclohexanecarboxaldehyde, 3-cyclohexene-1-carboxaldehyde, methyl cyclopropyl

ketone, methyl cyclohexyl ketone, methyl 1-cyclohexene-1-yl ketone, N,N-diethylcrotonamide, 1-methyl-4-piperidone, 1-ethyl-4-piperidone, methyl  $\beta$ -diethylaminoethyl ketone, methyl isocyanate, ethyl isocyanate, diethylcarbamyl chloride, diphenylcarbamyl chloride, ethyl isothiocyanate and phenyl isothiocyanate.

Hitherto, an  $\alpha,\beta$ -unsaturated amide, a basic ketone, an isothiocyanate, a carbamyl chloride or an isothiocyanate had not been used in this reaction.

It was found that Ivanov reagents can be prepared from 1-cyclohexenylacetic, vinylacetic and  $\alpha$ -phenylisocaproic acids. The Ivanov reagents obtained from the first two acids were allowed to react with cyclohexanone, and the Ivanov reagent prepared from the third acid was allowed to react with ethyl isocyanate.

In all instances the Ivanov reagents reacted in the same manner as typical Grignard reagents. When an Ivanov reagent was prepared from vinylacetic acid, and the reagent was then allowed to react with cyclohexanone, the nature of the reaction product,  $\gamma$ -(1-hydroxycyclohexyl)crotonic acid, showed that an allylic rearrangement of the Ivanov reagent had taken place.

When crotonic acid was treated with two molecular equivalents of isopropylmagnesium chloride, in an attempt to prepare an Ivanov reagent, 1,4-addition took place. The chloromagnesium derivative obtained reacted with cyclohexanone to yield  $\alpha$ -(1-hydroxycyclohexyl)- $\beta$ -isopropylbutyric acid, with phenyl isocyanate to form  $\alpha$ -(N-phenylcarbamyl)- $\beta$ -isopropylbutyric acid, and with water to yield  $\beta$ -isopropylbutyric acid. As far as we are aware, these reactions represent the first reported example of a 1,4-addition of a Grignard reagent to the salt of an  $\alpha,\beta$ -unsaturated acid.

The reaction of atropic acid with isopropylmagnesium chloride was also characterized by 1,4-addition. In this instance, the chloromagnesium derivative obtained was treated with water, whereupon  $\alpha$ -phenylisocaproic acid was formed. Tropic acid reacted in the same manner as atropic acid, presumably through the intermediate formation of the latter acid.

$\beta$ -Diethylaminoethyl esters, in the form of their hydrochlorides and methbromides, were obtained from the following acids:  $\alpha$ -phenyl- $\beta$ -cyclopentyl- $\beta$ -hydroxypropionic,  $\alpha$ -phenyl- $\beta$ -(1-cyclopentenyl)- $\beta$ -hydroxypropionic,  $\alpha$ -phenyl- $\beta$ -cyclohexyl- $\beta$ -hydroxypropionic,  $\alpha$ -phenyl- $\beta$ -(1-cyclohexene-3-yl)- $\beta$ -hydroxypropionic and  $\alpha$ -(1-cyclohexenyl)- $\alpha$ -(1-hydroxycyclohexyl)acetic acids. Hydrochlorides of the  $\beta$ -diethylaminoethyl esters of  $\alpha$ -phenyl- $\alpha$ -(N-ethylcarbamyl)acetic and  $\alpha$ -phenyl- $\alpha$ -(N-phenylcarbamyl)acetic acids were prepared. In addition to these esters, salts of the methyl esters of  $\alpha$ -phenyl- $\alpha$ -(1-methyl-4-hydroxy-4-piperidyl)acetic and  $\alpha$ -(1-ethyl-4-hydroxy-4-piperidyl)acetic acids were synthesized and submitted for pharmacological evaluation.

141 pages. \$1.76. MicA 55-1989

## CHEMISTRY, PHYSICAL

### THE STRUCTURE OF SOME COORDINATION COMPOUNDS OF COPPER AND NICKEL

(Publication No. 12,977)

Jack Dean Breazeale, Ph.D.  
University of Washington, 1955

An interest in a study of the bonds formed by the transition metals, particularly nickel, based on their coordination compounds has led to this preliminary investigation. The object of this work was to establish the configuration and structure of certain representative complexes.

Using established techniques of X-ray crystallography structures have been obtained for copper disalicylaldehyde, nickel disalicylaldehyde and nickel disalicylaldehyde. The space group and unit cell dimensions of tetrasalicylalpentaerithrityltetramine have also been determined.

The square coplanar configuration inferred by another worker for copper disalicylaldehyde has been corroborated and the configuration of nickel disalicylaldehyde has been shown to be square coplanar. Nickel disalicylaldehyde dihydrate has been shown to be octahedral with the water molecules at opposite apices and a trans arrangement of the bonds of the salicylaldehyde moieties to the nickel atom.

49 pages. \$1.00. MicA 55-1990

### REACTION OF ALKANES: NICKEL CATALYZED RACEMIZATION AND EXCHANGE WITH HYDROGEN AND DEUTERIUM

(Publication No. 13,072)

Warren Stanley Briggs, Ph.D.  
Northwestern University, 1955

The hydrogen atoms of several hydrocarbons have been found to exchange with deuterium in the presence of a nickel-kieselguhr catalyst at temperatures in the range of 90-130°C. The relative number of molecules which undergo exchange among the hydrocarbons tested can be arranged in decreasing order: n-heptane, 3-methylhexane, 3,3-dimethylhexane, and 2,2,3-trimethylbutane, with a factor of about seven between the extremes. The mass spectrograph has been used to determine the relative number of each exchanged species. Both n-heptane and 3-methylhexane show the presence of all possible exchanged species, all available hydrogen atoms capable of replacement with deuterium. A maximum of only seven exchanged hydrogen atoms is found in the case of both 3,3-dimethylhexane and 2,2,3-trimethylbutane, a number which is supplied by the hydrogen atoms available on the propyl groups attached to the quaternary carbon atoms present. This is interpreted to mean that the exchange process cannot proceed past a quaternary carbon atom.

Racemization of (+)3-methylhexane and (+)3-methylheptane proceeds under the same conditions where exchange occurs and may go to completion at somewhat higher temperatures. This reaction is specific in that less than 0.1% side reactions, such as isomerization and hydrogenolysis, occur even though racemization is nearly 100%.



It proceeds at a rate which is essentially independent of whether hydrogen or deuterium is present. A rate expression for racemization has been established and can be represented by:

$$k_o e^{-26000/RT} P_{H_2}^{-0.5 \text{ to } -0.7} P_{3MH}^{1/3}$$

The ratio of the number of molecules which undergo exchange to those which racemize is 1.5 to 1.6 and apparently independent of temperature within the range studied. This ratio supplements the information concerning relative abundance of exchanged species to suggest that exchange proceeds following adsorption, and after each individual exchange a probability exists then for the molecule to further exchange or to desorb. Racemization then occurs consequent to the process of exchange as it is propagated along the molecule. Hydrogen maintains catalyst activity, which drops off rapidly in its absence but can be restored by readmission of the hydrogen with evidence indicating a type of hydrogenation reaction occurring.

Any mechanism to explain this system is severely restricted by three important conditions:

1. Extensive exchange of available hydrogen atoms
2. Blocking of exchange propagation by a quaternary carbon atom
3. Specific racemization with no isomerization or hydrogenolysis.

A mechanism such as partial reversal of olefin hydrogenation is extremely plausible, but it must involve a symmetric intermediate. Three likely schematic representations are presented. 94 pages. \$1.18. MicA 55-1991

#### THE MECHANISM OF SPECTRAL EXCITATION OF METALLIC IONS BY A NEW HIGH TEMPERATURE SOURCE

(Publication No. 13,037)

Herman Edward Collier, Jr., Ph.D.  
Lehigh University, 1955

This paper describes a fundamental investigation of flame spectra as obtained from the standard flame sources,  $C_2H_2 + O_2$  and  $H_2 + O_2$ , and those obtained from the  $H_2 + F_2$  flame.

The study is divided into two sections. The first section describes the excitation of Li, Na, Mg, Ca, Sr, Ba, Al, Cu, Fe, Co, Ni, Cr, and Mn salts, dissolved in water, as obtained from the three aforementioned flames. In general it was found that the  $H_2 + F_2$  system provided far superior excitation, in terms of the intensity and the number of lines excited, as compared to the standard flame sources. The second section describes the excitation of Li, Na, Mg, Ca, Sr, Al, and Cu salts, dissolved in 95% Ethanol, Dimethylformamide, and a mixture of 95% Ethanol and Chloroform (50/50 solution V/V), as obtained from the standard flame sources. The  $H_2 + F_2$  system reacted with the organic solvents to such an extent that further investigation was directed toward the development of a new burner which would permit the use of organic solvents with this system.

The spectral excitation obtained from the standard flame sources and the organic solvents are much more

intense and more populated with lines than the corresponding results obtained using the same flame sources and water solutions.

The differences in the temperatures of the flames using the water solutions as compared to the organic solvent solutions do not warrant the observed increase in spectral intensities as shown by calculation from the Boltzmann distribution law. It is apparent that the organic solvent solutions produce a higher concentration of the metals within the flame than do the water solutions. Since the rates of atomization were approximately the same for all solvents, it is proposed that the difference in the rate of vaporization of the water and the rate of combustion of the organic solvents brings about the difference in metal concentration within the flame.

From the atomic and molecular spectra obtained it is proposed that the following phenomena play major roles in the results obtained by flame excitation:

(1) The spectrum of an element is almost completely dependent upon the type of compound formation the element undergoes within the flame.

(2) There are two factors about these compounds that must be considered.

(a) The lower the energy of vaporization the more favorable the spectral results.

(b) The lower the energy of decomposition of these compounds into the elements the more favorable the excitation.

(3) The lower the energy required to remove the solvent, by vaporization or any other process, the greater the excitation of the metals.

(4) The higher the available energy of the flame source the greater the atomic and molecular excitation of the metals.

This paper proposes to the field of flame spectroscopy a more complete explanation for the mechanism of excitation, the introduction of the  $H_2 + F_2$  system as a high temperature flame source, and to indicate the increased sensitivity in quantitative analyses that can be experienced by the use of the fluorine system.

87 pages. \$1.09. MicA 55-1992

#### EXCHANGE AND ISOMERIZATION REACTIONS OF DEUTEROETHYLENES ON NICKEL: PART I. EQUILIBRATION STUDIES. PART II. KINETIC STUDIES.

(Publication No. 12,983)

Ted Benjamin Flanagan, Ph.D.  
University of Washington, 1955

#### PART I. EQUILIBRATION STUDIES

A study of the equilibration reactions of transethylene- $d_2$  and of mixtures of ethylene- $d_0$  and - $d_4$  on nickel has been made. It has been shown that dissociative adsorption takes place; however, the equilibration reactions cannot be explained by a dissociative mechanism and a quantitative treatment has been given based on formation of the half-hydrogenated intermediate of Horiuti and Polanyi according to the associative mechanism. It is further shown that reaction arising as a consequence of dissociative

adsorption is of no significance in the presence of gas phase hydrogen.

## PART II. KINETIC STUDIES

It has been established that the isomerization and exchange of trans-ethylene- $d_2$  both occur by the same mechanism; the activation energies are very nearly the same from 35 to 195°C (the small difference is nicely explained by the associative mechanism as due to the difference in the C-H to C-D bond rupture probability). The activation energies are 13.5 Kcal and 15.0 Kcal for isomerization and exchange, respectively, for the temperature range 35-105°C and 6.0 Kcal and 7.5 Kcal for the temperature range 170 to 195°C. The orders of the pressure dependences of these reactions were found to be identical in the range 53 to 170°C. The orders were 0.4 to 53°C rising to first order at 170°C.

The mechanism which applies to both of these reactions involves breaking of the double bond by addition of an H from a dissociatively adsorbed ethylene to form an ethyl radical on the surface. Absolute rate calculations which have been made failed to differentiate between possible mechanisms which would involve an ethyl radical on the surface. If an H has been added to the double bond, then depending upon whether an H or D breaks in the half-hydrogenated state we have isomerization (one-half of the time) or exchange. From this ratio we have determined the C-H to C-D bond rupture probability from -78 to 410°C. C-H to C-D bond rupture probabilities have been calculated via Bigeliesen's theory; the calculated values are somewhat high although the temperature dependence is of the correct order of magnitude.

The isomerization and exchange reactions of trans-ethylene- $d_2$  have been studied in the presence of an equal amount of deuterium (5.8 cm). The product ratios found in the presence of deuterium indicate that the associative mechanism is also taking place in the presence of deuterium. Activation energies have been determined from 0° to 55°C in the presence of an equal pressure of deuterium; 6.9 Kcal for isomerization and 7.3 Kcal for exchange are the activation energies found.

174 pages. \$2.18. MicA 55-1993

## THE DECOMPOSITION OF BORON NITRIDE BY SLOW ELECTRON BOMBARDMENT

(Publication No. 12,862)

Bernard Jacobs, Ph.D.  
New York University, 1955

Adviser: George M. Murphy

Boron nitride was decomposed by bombardment with slow electrons. Below 4.38 volts the collisions were elastic; above this value, inelastic collisions occurred, with subsequent decomposition of boron nitride. The threshold potential was found to correspond to the energy gap for boron nitride between the valence band and the conduction band. It agrees with the value of 4.6 e.v. calculated by Coulson and Taylor (1).

At higher bombardment voltages, the rate of

decomposition increases and then goes through a series of maxima and minima. The minima are related to the initiation of different modes of decomposition. Numerical values for them are given, along with the corresponding reaction products. 76 pages. \$1.00. MicA 55-1994

1. Coulson, C. A. and Taylor, R. T., Proc. Phys. Soc. 65A, 834 (1952).

## A STUDY OF THE RELATION BETWEEN MOLECULAR WEIGHT DISTRIBUTION AND MECHANICAL PROPERTIES OF POLYVINYL ALCOHOL

(Publication No. 13,054)

David Winterton Levi, Ph.D.  
Virginia Polytechnic Institute, 1954

A study of the relation between mechanical properties and molecular weight distribution of polyvinyl alcohol was carried out.

The polyvinyl alcohol was fractionated with respect to degree of polymerization (D.P.) by precipitation of the fractions from 2% solution in water with a n-propyl alcohol-water nonsolvent. The initial small scale procedure was modified so as to accumulate fractions in sufficient quantity for the testing of mechanical properties and for the preparation of blends. The fractions were refractionated until further refractionation gave no further change in D.P.

The homogeneous fractions were cast into films using water as the solvent. These films were then used in determining mechanical properties.

A series of three blends, all with normal distributions and the same D.P. at the maximum of the differential distribution curve but with variable heights at the maximum D.P., were prepared and the mechanical properties were determined.

A second series of six blends, all with constant height and constant D.P. at the maximum, but all being skewed from the normal distribution, were prepared and their mechanical properties were determined.

A correlation of tensile strength with the shape of the distribution curve was found to have the form:

$$T = (8200 - 10^{6.87 - .00476P_m}) + (2.786 \times 10^6 H^{1.767} - 1000) + (1450 - 10.4B)$$

Where T is tensile strength

$P_m$  is D.P. at maximum of the differential distribution curve

H is height at the maximum

B is area skew

The second term in brackets is dropped when H is greater than 0.190 and the entire last term is dropped when B = 0.

A graphical correlation of mechanical properties with total percentage of low D.P. material gives fairly good results for polyvinyl alcohol and, using the data of other investigators, for cellulose nitrate, cellulose acetate, and polyvinyl acetate. 151 pages. \$1.89. MicA 55-1995



# THE DIPOLE MOMENTS OF SOME ANALOGUES OF BISACETYLACETONEETHYLENEDIIMINE AND ITS METAL CHELATES

(Publication No. 13,018)

Paul James McCarthy, S. J., Ph.D.  
Clark University, 1955

This study was undertaken for the purpose of learning more about the structure of some organic ligands and their metal chelates from a knowledge of the dipole moments of these compounds. About 25 compounds were prepared, the majority of them for the first time, and the dipole moments of 18 of these were determined; the values are given in the table below.

The dielectric constant measurements were made with a heterodyne beat apparatus which consisted of a Blily Crystal Controlled Oscillator (Model 1 C), a frequency meter (Zenith Radio Co., BC-221-T), and a National HRO "Sixty" radio. The precision condenser was a General Radio Co. condenser, Type 722 D. The dielectric constant cell contained three concentric platinum cylinders, and had a capacitance of 192.05  $\mu\text{f.}$  at 25.25°C., the temperature at which the measurements were made. Benzene was used as the solvent in all measurements. The densities of the solutions were determined by means of 25 ml. Rieschauer pycnometers.

The solute polarizations at infinite dilution were calculated by the method of Halverstadt and Kumler. The electron polarizations were determined by summation of the bond or atom refractivities, and in each case some allowance was made for the atom polarization. The dipole moments calculated are listed below. The maximum error for ligands is about  $\pm 0.12D.$ , and for the metal chelates, about  $\pm 0.15D.$

Compound	Dipole Moment (D.)
1) Bisacetylacetonethylenediimine	3.16
2) Bisacetylacetonethylenediiminocopper(II)	4.53
3) Bisacetylacetonethylenediiminonickel(II)	4.29
4) Bisacetylacetonethylenediiminopalladium(II)	4.72
5) Bisacetylacetonepropylenediimine	2.98
6) Bisacetylacetonepropylenediiminocopper(II)	4.63
7) Bisacetylacetonepropylenediiminonickel(II)	4.43
8) Bisacetylacetonetrimethylenediiminocopper(II)	4.23
9) Bistrifluoroacetylacetonethylenediimine	5.82
10) Bistrifluoroacetylacetonethylenediiminocopper(II)	9.60
11) Bistrifluoroacetylacetonocopper(II)	3.06
12) Bisbenzoylacetonethylenediimine	3.21
13) Bisbenzoylacetonepropylenediimine	2.39
14) Bisbenzoylacetonepropylenediiminocopper(II)	4.54
15) Bisbenzoylacetonepropylenediiminonickel(II)	4.35
16) Bisbenzoylacetonepropylenediiminocobalt(II)	4.03
17) Bisbenzoylacetonetrimethylenediimine	3.71
18) Bisbenzoylacetonetrimethylenediiminocopper(II)	4.24

The ligands are probably almost completely enolized in benzene solution. In all of them, rotation about the bridge carbon-carbon bond(s) is unhindered. Some of them have freedom of rotation about the two carbon-nitrogen bonds also, while in the rest, this latter rotation is more or less limited by steric hindrance. These facts together with the resulting differences in the number of possible spatial configurations seem best to explain the relative magnitudes of the ligand moments. The dipole moments together with ultraviolet spectral data show that the phenyl groups in compounds 12 to 18 must be adjacent to the bridge. Compound 9, on the other hand, has its  $-\text{CF}_3$  groups at the ends of the molecule.

All the metal chelates investigated have a square-planar configuration. The order of decreasing dipole moment was

found to parallel the order of decreasing stability. Structural parameters of the metal chelates are probably similar to those determined for bisacetylacetonethylenediiminocobalt(II) by Hughes, Barkelley, and Calvin. The position of the  $-\text{CF}_3$  groups in compound 9 is confirmed by the high moment of compound 10.

Compound 11, if it is square-planar, must be about 60% in the cis form. Presence of this form can be explained by hydrogen bond formation between the  $-\text{CF}_3$  groups and the water in the solution in which the chelate was prepared. The magnitude of the dipole moment can also be readily explained if it be assumed that formation of the cis isomer was complete, and that the repulsion of adjacent  $-\text{CF}_3$  groups has forced the molecule into a near-tetrahedral configuration. 100 pages. \$1.25. MicA 55-1996

# THE GASEOUS HEAT CAPACITY OF METHYL ALCOHOL AND ETHYL ALCOHOL BY THERMAL CONDUCTIVITY AT LOW PRESSURES

(Publication No. 12,621)

George Alford Miller, Ph.D.  
University of Michigan, 1955

It was the purpose of this research to measure the heat capacity of ideal gaseous methyl alcohol and ethyl alcohol with sufficient accuracy to permit a meaningful comparison with the values which can be calculated from molecular constants by accepted statistical methods. To this end it was decided to study the method of thermal conductivity at pressures of about  $10^{-3}$  mm. It was hoped to overcome some of the difficulties associated with this method and to extend its range of applicability.

Previous measurements of Eucken and Franck, using a single hot-wire in their conductivity cell, had resulted in a heat capacity of methyl alcohol at 280° K. which clearly could not be reconciled with any reasonable set of molecular constants. It appeared necessary to provide a reliable means of measuring both relative accommodation coefficients and low pressures in order to carefully check their results. Therefore, a bond-wire type of conductivity cell, originally devised by Eucken and Krome but not since mentioned in the literature, was constructed. This cell consists of a thin platinum band suspended parallel to a fine platinum wire. The band serves as a source of heat, while the wire serves as a thermometer which provides a relative indication of the accommodation coefficient. To this cell was coupled a Knudsen, low pressure gauge. This gauge is virtually independent of the species of gas being measured and offers a reliable means of determining the pressure of non-ideal and strongly adsorbed gases.

The conductivity cell was calibrated with argon. Secondary calibrations against nitrogen, hydrogen, helium, methane and ethane show that the apparatus yields reliable heat capacity data for gases whose accommodation coefficients are greater than 0.8 but not for gases of low accommodation.

For methyl alcohol the heat capacity of the ideal gas at constant volume at 279° K. is evaluated at  $8.14 + .08 \text{ cal./mole}^\circ \text{K.}$  This is found to be in close agreement with the barrier of 1071 cal./mole hindering internal rotation obtained from microwave data. In particular, the statistically

calculated heat capacity at this temperature falls almost exactly at 8.14 if the vibrational contribution is based on the frequency assignment of Noether, who has chosen values of 1209 and 1260  $\text{cm}^{-1}$  for the uncertain methyl rocking frequencies.

For ethyl alcohol the heat capacity at 279° K. is evaluated as  $12.90 + .13 \text{ cal./mole}^\circ \text{K}$ . This value agrees with the previous result of 12.85 obtained by Eucken and Franck. A reasonable barrier for the rotation of the OH group may be estimated, although the uncertainty of the methyl group barrier and the vibrational heat capacity precludes an accurate calculation.

An important result of this study is the demonstration that the Knudsen gauge provides a reliable means of measuring low pressures accurately for a wide range of gases to which it might be desired to apply the low pressure thermal conductivity method. In addition, it is shown that the band-wire cell of Eucken and Krome is a promising modification of the usual hot-wire thermal conductivity cell.

83 pages. \$1.04. MicA 55-1997

#### REACTIONS OF GROUP IVB METALS WITH AROMATIC N-NITROSOHYDROXYLAMINES AND THEIR ANALYTICAL APPLICABILITY

(Publication No. 12,631)

Edward Charles Olson, Ph.D.  
University of Michigan, 1955

In the present investigation those chemical and physical properties of the Group IVB metal chelates of the aromatic N-nitrosohydroxylamines have been studied which might be useful in the standard techniques of analytical chemistry; i.e., gravimetric, titrimetric, spectrophotometric, and electrochemical. Such an investigation indicates the value of thorough studies of organic reagents for inorganic ions in developing the background for analytical methods.

The specific objectives were then, first, to study the effects of varying the aromatic substituent on the electrochemical and spectrophotometric properties of aromatic N-nitrosohydroxylamines; to study various properties of the Group IVB metal chelates of these compounds; and third, to develop rapid methods for the determination of the Group IVB metals. The N-nitrosohydroxylamines studied were N-nitrosophenylhydroxylamine, N-nitroso- $\alpha$ -naphthylhydroxylamine, and N-nitroso-p-xenylhydroxylamine; the ammonium salts are known as cupferron, neocupferron, and p-phenylcupferron, respectively. The last is a new compound, first synthesized in the present investigation. The Group IVB metals are titanium, zirconium, hafnium, and thorium; stress was placed on the study of zirconium.

Study of the electrochemical behavior of the N-nitrosohydroxylamines included for each compound: (a) effect of pH upon half-wave potential and diffusion current over pH range -0.44 to 12; (b) logarithmic analysis of the polarographic wave at each pH; (c) determination of the nature of the current-controlling processes from the effects of variation of electrode drop-time and temperature on the diffusion currents; (d) variation of diffusion current and half-wave potential with concentration; (e) effect of ionic strength upon half-wave potential; (f) coulometric determination of the number of electrons involved in the

reduction in various pH regions; (g) isolation and identification of major reduction products by macroscale electrolysis; and (h) studies to support the proposed reduction mechanism.

Three well-defined polarographic waves can occur in the pH region from 1 to 11.7. The first wave split (change from Wave I to Wave II) corresponds to that of the typical acid-anion type equilibrium. The second wave split (change from Wave II to Wave III) is the result of a change in the reduction mechanism (i.e., in acidic solution aromatic N-nitrosohydroxylamines are reduced by a process, or processes, involving a total of six electrons to the corresponding hydrazine); however, in alkaline solution only four electrons are involved, with the final product being the aromatic hydrocarbon.

The electrochemical and spectrophotometric properties and solubilities in water and in 2 M sulfuric acid of the N-nitrosohydroxylamine chelates of the Group IVB metals were investigated. Only small differences in polarographic and spectrophotometric behavior exist between similar chelates of the different metals. Solubilities of about  $1 \times 10^{-7}$  moles per liter were found for all of the salts. From the variation of the ultraviolet absorption with pH,  $\text{pK}_a$  values were calculated.

In 4 M perchloric acid solution the existence was demonstrated of a series of soluble dichelates,  $\text{MA}_2^{+2}$ , formed by the Group IVB metals with aromatic N-nitrosohydroxylamines. The spectrophotometric and polarographic properties of the dichelates of each of the Group IVB metals were investigated.

The information obtained in the preceding investigations was applied to the amperometric titration of zirconium, hafnium, and titanium with standard cupferron solution. The metals can be titrated with a precision of better than  $\pm 0.3$  per cent (relative). Only very large amounts of fluoride and thiocyanate interfere among the anions tested, while iron(III), vanadium(V), uranium(IV), niobium(V), and large amounts of tin(IV) are the cationic interferences. Phosphate does not interfere.

The amperometric titration of zirconium with cupferron was then applied to the determination of zirconium in the presence of uranium and niobium. Good results were obtained after suitable modification. Methods for the complete analysis of zirconium-uranium-niobium mixtures were developed; these employed amperometric titration of zirconium with cupferron and direct simultaneous polarographic determination of uranium and niobium in concentrated hydrochloric acid.

184 pages. \$2.30. MicA 55-1998

#### A STUDY OF THE OXIDATION OF ALLYLTHIOUREA PHOTOSENSITIZED BY CHLOROPHYLL a

(Publication No. 11,992)

Kenneth Eugene Owens, Ph.D.  
University of Minnesota, 1955

Gaffron's study of the oxidation of allylthiourea photosensitized by chlorophyll has been extended using a series of alcohols of increasing viscosity as solvents. Highly purified samples of chlorophyll a were used. A new



experimental technique was employed using a closed circulating gas line of known volume and flow of the gas mixture through a porous glass disc which broke the gas mixture into small bubbles which rose through the reaction solution. The mixture of oxygen in nitrogen was cycled repeatedly around the line through the reaction solution and past an analyzing instrument by a small diaphragm pump. The extent of the reaction was followed by analyzing the gas phase for oxygen by means of its paramagnetism using an A. O. Beckman Oxygen Analyzer. Knowledge of Henry's law constants for the solvents used permits one to calculate the oxygen concentration in the solution from the partial pressure of oxygen in the gas phase. The 436 m $\mu$  line of mercury from the General Electric AH-6 lamp was used for illumination. The spectral output of this lamp in the wavelength region 390 to 525 m $\mu$  was determined. Light intensities were measured by means of a calibrated thermopile. Corrections were made for reflection at the various interfaces and for the amount of light scattered by the gas bubbles.

The quantum yield of the disappearance of oxygen was studied as a function of the concentration of dissolved oxygen. The results may be represented by:

$$\phi_{O_2} = K_1 \frac{(O_2)}{(O_2) + K_2} \frac{\text{molecules}}{\text{quanta}}$$

Solvent	$K_1$	$K_2 \times 10^6$
Methanol	0.21	2.5
Isoamyl Alcohol	0.52	9
Benzyl Alcohol	0.65	8
Cyclohexanol	0.82	20
Acetone	1.06	8

when the concentration of allylthiourea is  $0.051 \frac{M}{L}$  and the concentration of chlorophyll a is  $3 \times 10^{-6} \frac{M}{L}$ .

The following more general expression is required for methanol when the chlorophyll is  $3 \times 10^{-6} \frac{M}{L}$

$$\phi_{O_2} = 0.71 \left\{ \frac{(O_2)}{(O_2) + 2.5 \times 10^{-6}} + 260(O_2) \right\} \frac{\left\{ \frac{(A)}{(A) + 0.12} \right\} \text{molecules}}{\text{quanta}}$$

The effect of temperature upon the quantum yield in acetone was studied over the temperature range 0 to 35°C. These results indicate that a second reaction path, requiring approximately 30 K calories per mole activation energy, becomes important at higher temperatures. The effect of varying the intensity of absorbed light was negligible. One of Gaffron's experiments was repeated and good agreement was shown between his value for the quantum yield and those obtained in this research.

A mechanism is postulated which is in general consistent with the results. The reaction between a long-lived energetic state of chlorophyll a and oxygen controls the rate of the reaction. This process is very rapid and is diffusion controlled. The rate constant for this interaction is three to eight times greater than the limiting value calculated in terms of LaMer-Umberger equation. Similar behavior has been observed for other bimolecular reactions involving oxygen.

Chlorophyll a undergoes irreversible changes during

the oxidation reaction, but the quantum yields of these pigment reactions are small;

$$\phi < 10^{-2} \frac{\text{Molecules}}{\text{quanta}}$$

Some of the chlorophyll a is converted into a colorless product(s) and some is converted into a stable colored derivative which was isolated chromatographically. By means of spectrophotometric analysis, quantum yield measurements were made for both the disappearance of chlorophyll a and the appearance of the colored derivative as a function of the absorbed light intensity, and the concentrations of allylthiourea, chlorophyll, and oxygen in methanol. 165 pages. \$2.06. MicA 55-1999

#### A HOMOGENEOUS CARBOXYLIC TYPE ION EXCHANGE MEMBRANE

(Publication No. 13,046)

Stephen Sawruk, Ph.D.  
Lehigh University, 1955

Various methods were attempted to prepare homogeneous ion exchange membranes. Attempts to prepare a polystyrene sulfonic type ion exchange membrane by reacting polystyrene sheets with various sulfonating agents yielded a product which did not have satisfactory mechanical properties such as strength and flexibility.

A satisfactory homogeneous carboxylic type ion exchange membrane was prepared in the following manner: A solution which contained sixteen milliliters of styrene and four milliliters divinylbenzene (50-60%) was added to an excess of molten maleic anhydride, one-hundred and twenty grams. The mixture was heated to 59-61°C. and maintained in this temperature range with continual stirring for a period of eight hours. Ion exchange membranes of various thicknesses could be prepared, depending upon the amount of solution which was polymerized. Samples of the partially polymerized mixture were poured into flat bottom dishes which contained approximately one hundred milliliters of a five percent solution of ammonium persulfate. The final polymerization was allowed to take place over night in the solution of ammonium persulfate at 80°C. The samples were allowed to stand undisturbed during this period of polymerization in order that the desired ion exchange membrane of uniform thickness would form.

The prepared samples of ion exchange membrane had a uniform thickness of approximately 0.15 cm. The samples also had excellent strength and flexibility. Samples prepared by the above outlined method have an average tensile strength of 266 pounds per square inch. The ion exchange capacity of the prepared samples was 2.08 milliequivalent of hydrochloric acid liberated per gram of dry hydrogen form of membrane.

The proposed mechanism of the operation of the prepared ion exchange membrane is a combination of the various properties which have been studied. Samples of the prepared ion exchange membrane show excellent permselective properties in dilute solutions, from 0.001 to 0.1N potassium chloride. In this range of concentrations the transference number of the potassium ion is practically

unity. As the solutions on both sides of the membrane become more concentrated the anions begin to diffuse across the membrane and as a result the transference number of the potassium ion begins to fall off. At an average concentration of 0.3N KCl the transference number of the cation is 0.8. Upon placing the hydrogen form of an ion exchange membrane into various solutions of hydrochloric acid Donnan membrane type equilibrium is established across the prepared samples. The concentration of the acid solution inside the membrane is less than in the external solution. Osmotic pressure measurements were also made on the prepared samples; however, equilibrium is attained very slowly.

The prepared samples show excellent specific conductivity. The potassium and hydrogen forms of the prepared ion exchange membranes have a specific conductivity of  $2.8 \times 10^{-3}$  and  $9 \times 10^{-4}$  ohm $^{-1}$  cm $^{-1}$  respectively. Because of the excellent properties which the prepared membrane possesses, an ion exchange resin of this type should find wide spread use in commercial applications.

71 pages. \$1.00. MicA 55-2000

#### THE ROLE OF POLYPHOSPHATES IN THE WETTING STEP OF DETERGENCY

(Publication No. 13,047)

Charles Henry Schneider, Ph.D.  
Lehigh University, 1955

Empirical detergency testing has shown that the high-valency phosphates are superior builders but the fundamental basis for their supremacy or for the builder action in general is not completely understood.

It is known that builders affect the bulk properties of surfactant solutions but these effects have been definitely traced to the builder ion of charge opposite to that of the surfactant ion. At the present time no complete explanation of builder action has been put forth.

Most fundamental detergency investigations have been based on measurements of surface tension and/or oil-solution interfacial tensions. There has been very little work carried out involving the solid-solution interface. Obviously, this latter interface is the most important one in detergency but measurements involving the solid-solution interfaces are relatively more difficult to obtain. In addition most detergency investigations are usually carried out under equilibrium conditions.

Heat of immersion measurements were made of a standard "soil" in a series of built and unbuilt surfactant solutions. The standard "soil" was specially prepared very hydrophobic carbon black. This work was carried out at a constant surfactant concentration over a range of builder concentration for a series of builder salts. The curves obtained when the heat of immersion was plotted as a function of builder concentration contained maxima which decreased in height and occurred at increasing builder concentration as the anionic charge of the builder ion decreased. Sodium tripolyphosphate having an anionic charge of -5 produced the highest heat of immersion maximum and this maximum occurred at the lowest builder concentration.

In order to obtain the more fundamental heat of adsorption term, the heat of dilution and heat of micellization

terms were also obtained.

Comparison of the experimentally obtained heat of immersion data with the calculated heat of immersion data showed that only increased adsorption of the surfactant ions could account for the maxima in the curves. This increased adsorption was in turn shown to be a result of the increase in the rate of adsorption.

Conductance measurements carried out during adsorption experiments confirmed the belief that the rate of adsorption was definitely increased by the presence of builders. Furthermore, these conductance measurements showed that the rate of micelle dissociation was increased by the presence of builder salts.

A mechanism for builder action has been suggested. This mechanism is based on the idea that electrolytes with high anionic charge distort the micelles present in the solution and thus increase the rate of micelle dissociation.

This investigation has shown that the importance of polyphosphate builders in detergency can be partially attributed to their effect on the rate of micelle dissociation in a surfactant solution. The increased rate of micelle dissociation increases the rate of adsorption of surfactant anions on the hydrophobic solid surface.

80 pages. \$1.00. MicA 55-2001

#### INFRARED INVESTIGATION OF SOME SUBSTITUTED AMMONIUM COMPOUNDS

(Publication No. 12,784)

Robert Sidney Silas, Ph.D.  
The University of Florida, 1955

In this study, the infrared spectra of some substituted ammonium salts were studied in the 2-9 1/2 micron region with a calcium fluoride prism. Fifteen monosubstituted, six disubstituted, three trisubstituted, and three tetrasubstituted compounds were studied. All of the samples were prepared by the potassium bromide pressed pellet technique.

The spectra of the monosubstituted compounds studied indicate that the asymmetric and symmetric  $\text{NH}_3^+$  stretching vibrations occur in the ranges 3096-3077 cm $^{-1}$  and 3046-3003 cm $^{-1}$  respectively when a saturated carbon atom is adjacent to the nitrogen. Although the spectra were not well resolved, there were indications that when the nitrogen atom is conjugated with a double bond or an unbonded pair of electrons, at least one of the stretching fundamentals occurs in the range 2706-2554 cm $^{-1}$ .

The asymmetric and symmetric  $\text{NH}_3^+$  deformations were assigned ranges 1599-1569 cm $^{-1}$  and 1505-1492 cm $^{-1}$  respectively. This assignment was somewhat doubtful for compounds containing aromatic rings since the ring deformations also occur in this range.

It was not possible to assign definite ranges for the  $\text{NH}_2^+$  and  $\text{NH}^+$  stretching vibrations. All of the compounds of these types which were studied had several strong bands in the range 2800-2350 cm $^{-1}$  which may be due to these fundamentals.

The expected  $\text{NH}_2^+$  deformation was found in the range 1589-1570 cm $^{-1}$  for the compounds studied. The  $\text{NH}^+$  deformation was tentatively identified with a band in the range 1444-1430 cm $^{-1}$ .



This study indicates the possibility of determining the degree of substitution of an alkyl substituted ammonium salt by an examination of the 3100-3000  $\text{cm}^{-1}$ , 2800-2350  $\text{cm}^{-1}$ , and 1600-1500  $\text{cm}^{-1}$  regions.

It was noted that a methyl group attached directly to the nitrogen in this type of compound had an absorption at about 3030  $\text{cm}^{-1}$ . This effect has been noted previously in the Raman spectrum of this type of compound. The hydrogen deformations on carbon atoms adjacent to the nitrogen atom appear to be shifted to a higher frequency in all cases. The shift is usually on the order of about 20  $\text{cm}^{-1}$ . No other definite correlations of frequency shifts with structure were made.

Tentative assignments were made for most of the bands appearing above 1350  $\text{cm}^{-1}$ . No attempt was made to assign bands which appeared at lower frequencies. The spectra of all of the compounds studied are included.

97 pages. \$1.21. MicA 55-2002

#### THE CHEMISTRY OF THE DEGRADATION OF COLLAGEN

(Publication No. 13,048)

George Strauss, Ph.D.  
Lehigh University, 1955

The shrinkage and gelatinization reactions of native collagen were investigated in terms of the kind and number of intramolecular bonds involved in these reactions. This was done by measuring heats of immersion of collagen into water above and below the shrinkage temperature.

A method for isolating pure native collagen from cattle hide was developed after critically evaluating existing purification methods: The external layers of the hide were removed mechanically and the corium remaining was extracted with 1% and 10% NaCl solutions to remove globular proteins; the material was then dehydrated in acetone and freed of fat by chloroform. Shrunken collagen was prepared by treating native collagen with boiling water and dehydrating it over boiling xylene. The degree of shrinkage was found to be variable and to depend on the experimental conditions of shrinkage, particularly temperature.

An adiabatic calorimeter was constructed to measure heat changes, using thermistors as sensing elements. Temperature changes could be measured to within  $\pm 0.0005^\circ$ , corresponding to  $\pm 0.3$  cal./gram protein.

Heats of immersion of native collagen, shrunken collagen, and gelatin into water, 2.90 molal NaCl and 2.70 molal NaSCN solutions were measured at temperatures of  $30^\circ$  to  $80^\circ$ . All samples were moisture-equilibrated at 43% R. H. and  $25^\circ$  before immersion since the heat of immersion changes considerably with initial moisture content. The amount of protein dissolved and the degree of swelling of the undissolved fraction during each experiment were also determined.

From these results the heat of shrinkage and the heats due to other processes occurring during immersion were calculated. Comparison of results for the three liquid media used gave information on the role of intramolecular ionic and hydrogen bonds.

The overall heat of immersion, which may be positive or negative, is the algebraic sum of the heat of hydration

and swelling (exothermic), the heat of solution (endothermic), and, where applicable, the heat of shrinkage (exothermic).

The heat of shrinkage amounts to -2 to -3 cal./gram and is apparently due to the formation of additional hydrogen bonds. The increase in the number of such bonds as calculated from heat data checks with that calculated from water vapor adsorption data.

The positive heat of activation for the shrinkage reaction found by other workers can now be interpreted as the energy required to break existing bonds in the native collagen prior to shrinkage and to the formation of new, more numerous crossbonds.

The heat of solution averages 172 cal./gram which is of the right order of magnitude if solution entails the breaking of two or more hydrogen bonds per amino acid residue.

For native and shrunken collagen the heat of swelling is independent of temperature and amounts of -14 to -24 cal./gram, depending on the liquid medium used. These substances also show no change in the degree of swelling with temperature. For gelatin both the heat of swelling and the degree of swelling increase with temperature. The maximum heat of swelling is -150 cal./gram.

Swelling, solution, and shrinkage are all affected by internal crossbonds. These processes are facilitated by (a) ions in solution which by their screening action weaken internal bonds and (b) ions or molecules (such as  $\text{SCN}^-$ ) which add on to polar groups on the protein and so break internal hydrogen bonds.

After completion of the initial processes of immersion a delayed large heat absorption was observed. This secondary process, while not clearly understood, is thought to involve "internal solution" in the case of collagen and breakdown of the swollen gel in the case of gelatin.

113 pages. \$1.41. MicA 55-2003

#### LOW POLYMER-SOLVENT INTERACTION. SOLUBILITY AND HEAT OF SOLUTION OF POLYINDENE.

(Publication No. 13,050)

Jack Vanderryn, Ph.D.  
Lehigh University, 1955

The solubility properties and heats of solution were determined for a polyindene resin (mol. wt. 749) and four of its fractions (mol. wts. 401, 842, 1350, and 1790) in a variety of organic solvents in order to investigate the nature of low polymer solutions. The intrinsic viscosity of the unfractionated polymer was measured in five of the solvents. Preliminary measurements of the vapor pressure of the polyindene - benzene system are also reported.

Results of the determination of the solubility of polyindene in mineral oil and in mineral oil - low mol. wt. resin systems are presented as two- and three-component phase diagrams and indicate that (1) the precipitation temperature of an unfractionated polymer is largely controlled by its highest molecular weight fraction, (2) the critical composition occurs at polymer concentrations much lower than predicted by theory, (3) even though a polymer is completely miscible in the system it may not act as a true solvent, and (4) although several polymers

have solubility parameters which are almost identical their quantitative solubilities in a particular system may be quite different.

The solubility parameter for polyindene was approximately 9.2 as determined from (1) solubility in various organic solvents, and (2) critical solution temperature and critical composition in aniline. The greatest deviation from the predicted critical polymer composition was exhibited by systems having the highest critical solution temperature. The molecular weight of the individual fractions did not appear to have any well-defined effect on the critical composition. The low critical compositions were tentatively attributed to entropies of mixing which are lower than the calculated configurational entropy of mixing.

The thermodynamic parameters for solutions of polyindene in amyl and heptyl alcohol were calculated from precipitation data of its fractions according to the method of Shultz and Flory. The values for these parameters are about 1/2 of the values for the parameter for the polystyrene (high mol. wt.) - octyl alcohol system. This difference cannot be explained on the basis of existing theory.

Measurements of the heat of solution of polyindene in twenty one different solvents indicate that the heat of

solution is related to the chemical nature of the solvent-polymer interaction and to the structure similarities and differences between polymer and solvent. Both endothermic and exothermic values were obtained for the heat of solution depending on the solvent. The heat of solution also depended on the thermodynamic state of the polymer which, in turn, was related to its molecular weight and structure, and which was reflected in its second-order transition temperature. The Hildebrand-Scatchard equation for the heat of mixing of nonelectrolytes could not be used to predict the values of the heats of solution.

Intrinsic viscosity measurements indicated that the polymer molecules were extended in an exothermic solvent and were curled up in an endothermic solvent. The magnitude of the heat effect was of little importance in influencing the amount of extension or contraction of the polymer molecule in solution.

Vapor pressure and heat of solution measurements indicated that the partial molal entropy of benzene in the polyindene-benzene system was in close agreement with the values calculated from the Flory-Huggins equation. The agreement was better than that for high polymers calculated from the temperature dependence of the activity.

107 pages. \$1.34. MicA 55-2004



## ECONOMICS

### ECONOMICS, GENERAL

#### PRICE FORMATION IN THE MILITARY MARKET FOR MEDICAL MATERIAL

(Publication No. 12,690)

Wilber Cary Haseman, Ph.D.  
Syracuse University, 1955

The military market for medical material is a very narrow and highly specialized sector of the nation's economy comprised of a single buyer, the Armed Services Medical Procurement Agency (ASMPA), and numerous groups of obligopolistic or monopolistic sellers who bid upon military contracts for medical material. This market is overlapped to a certain degree by various civilian markets which exchange ethical drugs, medicines, and medical supplies, and equipment. The same sellers are involved in the civilian and military markets and the products exchanged in these markets ordinarily are so much alike that they may be intermingled on the production line throughout most stages of manufacture, resulting in a cost interdependence. The products are not so much alike, however, that they may be traded interchangeably between the two markets; also there are important differences in the organization of the civilian and military markets which effectively isolate the military market from the civilian markets and thus usually permit discriminatory pricing.

The main problem of this study is to examine the adjustment of individual firms under the highly specialized conditions met in this market to determine to what extent the traditional marginal analysis of Chamberlin, Triffin, and others conforms with pragmatic experience.

Three types of data were collected and are analyzed in the main body of the study. 1) The expressed opinions and attitudes of medical material suppliers were secured by interviewing those officials who prepared contract bids in some thirty-one different firms. The information obtained during these interviews mainly concerned the procedures followed in determining contract bid prices. 2) The actual prices bid by firms on some forty-seven different military purchases of medical material representing four selected products during the period 1949-1951 were obtained from ASMPA's procurement files. 3) The net wholesale prices for the four counterpart civilian products as well as data regarding manufacturing processes were secured from suppliers.

In the main, the results of the study support the traditional marginal analysis if one allows for certain reasonable adjustments in one's approach to the problem. Suppliers tend to price military contracts in relation to their anticipated contract out-of-pocket costs (a concept related to marginal cost) with an allowance for profit which may be higher or lower depending upon the degree of rivalry which exists, pricing strategy, accepted bidding procedures, and (in certain cases) bidding strategy employed by ASMPA. Prices in the military market are usually discriminately lower than those for closely related products in the civilian

markets. From one time to another, contract out-of-pocket costs and suppliers' profit allowances, and, thus, the level of military contract prices, are influenced by a variety of factors including changes in the price level for raw materials, differences in the size of contracts, changes in the availability of unused plant capacity, and changes in the volume of supplier's unfilled orders.

308 pages. \$3.85. MicA 55-2005

#### ECONOMIC JUSTIFICATION ANALYSIS OF PUBLIC CONSTRUCTION FOR RESOURCE DEVELOPMENT

(Publication No. 12,595)

Ronald Stafford Johnson, Ph.D.  
University of Michigan, 1955

This study develops a micro-economic theory of public construction projects, expressed in a principle and rule to follow in making decisions on the relative desirability of projects, on the scale or capacity of projects, and on the allocation of public funds within an investment program. The bases for such decisions are called economic justification analyses.

It is concluded that the following principle and one implied rule are useful and proper guides in making allocative decisions:

##### The Principle

The agency responsible for economic justification should conduct its analysis under the pretense that it is advising an association of the first users of the products and services of the project and on the assumption that this hypothetical association will own the project, will bear its direct costs, and possesses the capital required.

##### The Rule

No benefit or cost, appropriate for consideration in the justification analysis, arises merely from the fact that a unit of government may build, own, and operate the project.

The procedure involves a comparison of the results of the above principle with the results of the net-contribution-to-national-income approach to justification as outlined in two recent government publications,<sup>1</sup> according to the answers to each of the following questions:

1. What are the benefits and costs appropriate for consideration?
2. How should the benefits and costs be valued, considering chronological and price level differences?

3. How should benefits be compared with costs – by using a rate of return or a ratio of benefits to cost method? If the latter method is to be used, how should the ratio be calculated?

The correct answers to the above questions are first determined on economic grounds. They are then compared with those obtained by use both of the suggested principle and of the net-contribution-to-national-income approach. The former seems to lead to the more rational economic decision in each case.

A final chapter outlines a method for determining the optimum allocation of resources within an investment program. Two situations are discussed: (1) when available funds are adequate to build each project in a program to its optimum capacity in relation to alternative investments both within and without the government sector of the economy, and (2) when a limitation of funds available for a program prevents attainment of project capacities which are optimum in relation to the economy as a whole. In each situation the above principle and rule prove useful guides to the correct economic solution.

169 pages. \$2.11. MicA 55-2006

1. U. S. Government, Federal Inter-Agency River Basin Committee, Subcommittee on Benefits and Costs, Proposed Practices for Economic Analysis of River Basin Projects, (May, 1950, Washington).

U. S. Government, The President's Water Resources Policy Commission, A Water Policy for the American People (United States Government Printing Office, Washington, 1950).

## ECONOMICS, COMMERCE – BUSINESS

### THE DICTATION PROBLEMS OF BUSINESS EXECUTIVES

(Publication No. 13,209)

Ray William Arensman, Ed.D.  
Indiana University, 1955

Chairman: Elvin S. Eyster

#### The Problem

This is a study of the dictation problems of business executives. It involves identification of the dictation problems and discovery and appraisal of any dictation practices, ideas, suggestions, solutions, or points of view pertaining to the solution of those problems.

#### The Procedure

Data underlying the dictation problems were obtained by interviews and visitations with 81 executives employed by firms in Indiana. An interview guide was used to insure that the procedure would yield evidences, observations, situations, and facts from which the dictation problems could be deduced. The interviewing continued until the point of diminishing returns was reached and no new problems were revealed.

Suggested dictation practices and points of view of recognized authorities and authors in the field of business communication were obtained by an extensive analysis of the available literature in the various fields of business administration. Materials used by 73 organizations in the training of dictators also were searched for practices and points of view pertaining to dictation problems. These practices and points of view were analyzed to determine those which seemed to have the best possibility of preventing, eliminating, or alleviating dictation problems.

#### Findings

The dictation problems of business executives are closely related to the attitudes and personality of the dictator or to competencies attendant to dictation. Executives are often complacent or indifferent concerning their dictation problems and practices. On the other hand, many executives are overly fastidious or meticulous about their dictated messages. Problems sometimes arise because dictators have feelings of inferiority or timidity about their dictation abilities. Many of the dictation problems of executives are related to their lack of knowledge of business communication or to their lack of information about business procedures and practices.

The practices and points of view pertaining to dictation problems concern the organization of the dictation task, the planning of dictation, the mechanics and effectiveness of written expression, the company environment for dictation, the recording and transcribing process, and relations between the dictator and the reader.

#### Conclusions

The process of dictation is both complex and complicated and involves many problems. Most dictation problems pertain to the dictators themselves; a few are concerned with the conditions under which dictation takes place. The problems of dictators frequently revolve around attitudes, points of view, personality traits, work habits, knowledges, and skills.

Dictation problems can be resolved primarily through raising the executives' level of competency in communications in general and in dictation in particular. This level of competency can be raised by education and training at both the collegiate and the in-service levels.

221 pages. \$2.76. Mic 55-263

### THE ADMINISTRATION AND OPERATION OF COMMON OFFICE SERVICES (Volumes I and II)

(Publication No. 13,215)

Harold Adrain Coonrad, Ed.D.  
Indiana University, 1955

Chairman: Elvin S. Eyster

#### The Problem

The problem is a comprehensive study of six common office services in 16 business firms: (1) stenographic and typewriting, (2) filing, (3) mechanical communications,



(4) mail and messenger, (5) duplicating, and (6) office supplies. The problem involves a study of: administration; procedures; personnel selection, training, and utilization practices; equipment procurement and maintenance practices; and cost reduction and control practices.

#### Procedure

Business firms were chosen for the study from companies recommended by vendors of office equipment as having well-organized office services. Information regarding the administration and operation of the common office services was obtained from the companies through interviews with company personnel and through a study of company publications related to the administration and operation of the common office services.

#### Findings

The findings are classifiable into four major categories: (1) office services administration and operation; (2) personnel selection, training, and utilization practices; (3) equipment procurement and maintenance practices; and (4) cost reduction and control practices.

Office services administration and operation. The centralized plan of organization was employed extensively. With few exceptions, the responsibility for the operation of centralized office services was delegated to the office manager.

The procedures for performing a particular office service were fairly uniform from firm to firm. Also, fairly uniform principles of operation were utilized in all of the office services studied in a particular firm; for example, the regular intraoffice messenger service was employed widely for delivering work to and from the primary departments and the centralized service units, and work was performed in the service units in the order in which it was received. Certain aspects of procedures were peculiar to specific office services or to a particular business firm.

Personnel selection, training, and utilization practices. The personnel selection function, in general, was centralized; tests were used in the selection process. In most cases, a separate personnel department was maintained. Job training was informal. Individual production records were kept only for workers in the centralized stenographic and typewriting services.

#### Equipment procurement and maintenance practices.

The most widely followed plan for the procurement of office equipment was to have the purchases initiated by department heads; however, in the interest of standardization and over-all adaptability of the equipment, all purchases were approved by the office manager or by a company-employed office methods analyst. Machines were repaired on a service-call basis, on a service-contract basis, or through a company-operated repair service.

Cost reduction and control practices. The most widely followed cost control practice was to charge the cost of operation of centralized office services to the departments served. However, the practice was limited to the mechanical communications, duplicating, and office supplies services.

#### Implications

Inasmuch as the 16 companies were known to have well-organized and smooth-functioning centralized office

services, the findings suggest certain implications for the administration and operation of office services generally: centralization is practicable for most office services; the standardization of over-all procedures for the performance of office services is impossible, from service to service or from company to company; centralization of responsibility for personnel selection in the office service areas is highly desirable; initial purchase or the replacement of office equipment should be initiated by the heads of primary departments in which the equipment is to be used, and various plans may be employed for the repair and maintenance of office equipment; and an effective approach to cost control is sound organization and the employment of qualified supervisors.

638 pages. \$7.98. MicA 55-2007

#### COST AND OUTPUT RELATIONSHIPS OF CONSUMER INSTALMENT CREDIT AGENCIES: BASED ON REPORTS OF INDIANA LICENSEES

(Publication No. 13,082)

Loring Chapman Farwell, Ph.D.  
Northwestern University, 1955

The purpose of this study is to measure and characterize relationships between cost and output in consumer instalment credit agencies. Studies of these relationships in individual firms have been made in the past but they yield such diverse results that common characteristics of industry groups fail to emerge. Other studies, which are directed to investigation of industry characteristics, have resulted either in indefinite conclusions or have failed to account for pertinent factors likely to have influenced the results obtained. Yet it seems reasonable to expect that fairly definite, quantitative conclusions on cost and output association in this field can be derived from existing data. Figures collected under standard reporting conditions have been published in at least one state for a number of years and cover both small loan and time sale finance operations. These operations are such that a constant unit cost assumption appears tenable as a working hypothesis. Operating activities of the agencies in industry groups are very similar and their operating procedures have changed little, if at all, over several decades.

To implement the study, data are obtained from Annual Reports of the Department of Financial Institutions, Indiana. Cost data are classified to separate those components likely to be affected as to amount by change in external factors such as employment conditions, legislative action or bank credit standards from those likely to be affected only by change in demand for credit services. The former are called "non-operating," the latter, "operating" costs. Investigation of relationships between non-operating costs and output is limited to consideration of a number of simple devices for indicating a working association. The ratio of these costs to average outstanding credit balances of the agencies is accepted as descriptive of this association.

The investigation of associations between operating cost and output in small loan offices and in time sale finance companies are separated. In both cases, however, the amounts of operating cost per annum appear to be directly and constantly proportional to the number of

credits granted and the amount of servicing activity required on credits outstanding. Deviations from year to year from this basic relationship appear to be associated in the small loan case with changes in the number of credits granted per office, i.e., with the effectiveness of utilization of capacity in the short-run, and with changes in the average initial size of credits granted, i.e., with the basis on which revenues are determined. Similar deviations in the time sale finance case appear to be associated with changes in the proportions of automobile to other credit contracts granted and of wholesale to retail financing. The results of this study are summarized in two linear, multiple regression equations.

The forms of relationship indicated by the two regression equations lead to a number of tentative conclusions about operating practices and regulatory policies for the two credit industries. In both cases, sensitivity of total cost to change in average initial credit size and contract duration is indicated. Comparison of the equations indicates that small loan procedures would probably be more effective for handling small credit demands in those areas where cash and sale credit are substitutable. The nature of the restrictions imposed on the small loan industry by the form of the legal charge maxima in force in Indiana and under conditions of rising price levels is also indicated. Differences are observed in the practical effects of the statutory limitations of charges as illustrated by the small loan and time sale finance laws in Indiana.

348 pages. \$4.35. MicA 55-2008

#### A STUDY OF THE BALANCE OF PAYMENTS OF LEBANON, 1951 AND 1952

(Publication No. 12,982)

Edward Chingtien Fei, Ph.D.  
University of Washington, 1955

The calculation of the balance of payments of Lebanon for the years 1951 and 1952 was started in the autumn of 1951, and required almost three years of data collection and field work. In the main, three types of work were involved:

1. The limited reliable data that existed, primarily customs statistics, were ill-suited for balance of payments purposes. It was necessary to take these data, make suitable adjustments and corrections for coverage and valuation, and in general refine, compute, and compile meaningful aggregations for use in constructing the balance of payments.
2. For many sectors of the economy no data existed. In these cases individual sub-projects were set up to obtain the necessary information. These included surveys and questionnaires in many diverse areas - emigrant remittances, seasonality of imports, earnings from summer resorting (*estivage*), gold trade, etc.
3. The calculation of the balance of payments involved the piecing together of the various component items and the construction of the balance from the derived data.

The present dissertation comprises three chapters. Chapter I presents a summary of the Lebanese background, including its history, political organization, geography, and economic conditions.

Chapter II is devoted to the elaboration of the various methods and procedures involved in the derivation of the balance of payments. Each component item is treated separately, and the details of the relevant surveys, compilations, and calculations are outlined step by step. A total of about sixty statistical tables, maps, and questionnaire forms are appended to supplement the discussion.

Chapter III provides an analysis of the characteristics of the balance of payments and its component items, and indicates the importance of foreign trade to the domestic economy. The chapter concludes with a brief discussion of the future of Lebanon's foreign trade and foreign economic policy.

In summary, it may be said that the foreign trade sector is relatively free of controls with the government playing a minor and passive role. Lebanon is faced with a large and persistent commodity import surplus, balanced largely by the export of miscellaneous commercial and financial services, especially transit and entrepot trade. On the debit side, merchandise imports are the principal item, constituting 88 per cent of total current account payments. On the credit side, merchandise exports and export of services are equally important, each constituting approximately one-fifth of total current receipts; next in importance are foreign governmental operations, donations, and foreign travel. Income from private donations, historically an important source of receipts, seems on the decline. Foreign capital flows are quite irregular, depending primarily on the international political situation. With reasonable effort on the part of business and government, earnings from trade, tourism and services, including the operation of the Free Zone, could be substantially increased.

On the other hand, while Lebanon's foreign transactions are roughly in balance, her domestic economy is in a depressed state. Quite apart from any activity, private and governmental, directed towards the improvement of the domestic economy, expansion of her foreign trade could be especially important, both in assisting domestic industries and in providing the means for economic development. Because of Lebanon's strategic position in the network of trade, communications and finances of the Middle East, and because of the rising tempo of developmental plans in all countries in the area, Lebanon should embark on a positive economic policy aimed at long-run gains to herself through participation in, and assistance to, the growth and development of other countries in the Middle East.

217 pages. \$2.71. MicA 55-2009

#### AN ANALYSIS OF THE WAGE STABILIZATION BOARD'S CRITERIA IN WAGE DETERMINATION

(Publication No. 12,889)

William Chester Ferguson, Ph.D.  
State University of Iowa, 1955

Chairman: Professor W. L. Daykin

In an economy already operating at peak levels of production and employment how much "give" is there in a labor force to meet the demands of an emergency? Careful plans have to be made to conserve the resources of skilled manpower, because the nation's strength lies in the



skill and productivity of its labor force, rather than in sheer number.

There are few activities affecting the wages, hours and conditions of employment, either directly or indirectly, that are not considered bargainable issues in the field of collective bargaining.

A clear understanding of the economic implications of the various wage arguments will often discourage extravagant and unwarranted claims. This will help to produce a meeting of the minds and prevent disputes leading to work stoppages, strikes, and lockouts. Wages constituted the major issue coming before the War Labor Board in World War I, being involved in more than half the cases.

The work of the National Defense Mediation Board clearly shows that this board did not operate under formulated principles and that its disposition of one case did not serve as a precedent in another. There was even a resolution by the Board to that effect.

The executive order by which the National War Labor Board was created made it clear that the effect of the dispute upon the war effort and not the subject matter of the dispute was to be the criterion which determined the Board's Jurisdiction. The Board had two vital powers: It could withhold contracts or it could enforce its priority rulings; it could make final disposition of the disputes or it could seize plant.

Perhaps the greatest advantages that the War Labor Board had was that the National Defense Mediation Board had explored many of the problems which served as a basis for its work and for the work of future boards.

Wage stabilization was an essential ingredient of the defense mobilization program. It was, of course, only a part of the total program, but a highly essential part.

Freedom of economic action is a characteristic of our free society. When, however, the nation is forced into a state of emergency by armed aggression in the world, the public interest intervenes in economic decisions and some temporary limits have to be placed around the freedom of action. A set of emergency rules has to be drawn up by which everybody is expected to abide.

General Wage Regulations 6, 8, and 10 Constituted the cornerstone of Wage Stabilization Board Policy as the "Little Steel" formula had served the War Labor Board during World War II.

The initial policies of a stabilization program are likely to be backward-looking policies. Stabilization also has a positive meaning. It operates in a context of changing economic forces and circumstances.

How to balance war production and civilian production was a problem faced by the Wage Stabilization Board without precedent.

The legal basis for the operations of the Wage Stabilization Board is given in both statute and in executive order.

When the President conferred upon the Wage Stabilization Board authority to recommend settlement of labor disputes, he was careful to direct the handling of disputes "shall be administered in such a way as to preserve collective bargaining between Labor and Management."

This Board was inferior to the National Labor Relations Board. It was granted only limited dispute settling functions, and its powers were only recommendatory. In addition to all of these weaknesses which

existed in the Board's structure it was DENIED the power of seizure. 197 pages. \$2.46. MicA 55-2010

# A STUDY OF SELECTED CASES OF LITIGATION IN TWO IOWA DISTRICT COURTS WITH PARTICULAR REFERENCE TO THE CONTENT OF THE BUSINESS LAW COURSE

((Publication No. 12,912))

Edwin A. Nash, Ph.D.  
State University of Iowa, 1955

Chairman: Professor William J. Masson

## Statement and Delimitation of the Problem

A major problem exists with respect to the determination of the content of the business law course. Both circumstantial evidence and professional opinion seem to justify a thorough investigation in order to determine the desirable content for the business law course.

The possible approaches to content determination include:

- (1) textbook and course of study analysis,
- (2) analysis of aims and objectives,
- (3) opinion of educators, lawyers, business men, and parents, and
- (4) observation of the matters in litigation.

The latter approach is utilized. The public record of those problems of people within their legal environment are studied and observed for their implications for business law course content.

Since litigation occurs continually in many types of courts, an individual researcher must limit his investigation of it. This limitation is in terms of the selection of two Iowa district courts for the particular years of 1945, 1948, and 1951. It is also recognized that a study of the matters in litigation in two particular courts will not result in revealing all of the problems of people within their legal environment; consequently this study does not lay claim to evidencing the total course content for business law; the study does strive to make a partial contribution toward the total determination of course content for business law.

The business law course is conceived to be the whole body of experiences and activities utilized by the school to achieve the objectives of business law, whether they occur at the secondary educational level, or the college and university level. The content of the business law course is conceived to relate to the knowledge, information, and concepts which contribute(s) to the attainment of the objectives of the business law course.

## Purposes of the Study

The purposes believed to be most nearly fulfilled are stated as:

- (1) to ascertain and describe the matters in litigation pertaining to business law as delimited,

(2) to assemble evidence as to the needs and problems of people within their legal environment which should be helpful to: business law teachers, curriculum workers, students of business law, and persons charged with responsibility for the administration of general education and business education.

(3) to detect specific and general subject matter content for the business law course as may seem justified by study and analysis of the litigation examined,

(4) to facilitate, by means of assembly and description of litigation, the introduction of "live material" into course content,

(5) to utilize a portion of the business (legal) community as a source laboratory for desirable educational experiencing, for the writer, reader, and/or user of this study, and

(6) to provide measures of the relative importance of litigated matters as revealed by their frequency of occurrence.

#### Research Procedure

The procedure of research included:

(1) developing case descriptions of each litigated folder, (2) tabulating, classifying, and analyzing the matters in litigation within these case descriptions,

(3) constructing lists of legal problems after classification of them, and

(4) developing content to relate closely to these lists of legal problems.

#### Conclusions and Recommendations

The major conclusions include:

(1) based upon statistical analysis, that the litigated matters presented in this study comprise a substantial cross section of litigation generally within the State of Iowa,

(2) that business law course content can be constructed by selecting it so as to solve overt legal problems of people, and

(3) that such content can be expanded or contracted in accordance with proportions existing between classified groups of litigated matters as revealed by frequency of occurrence.

A major recommendation is for the question of allocation of time, material, and emphasis in the total content of the business law course to be attacked through the coordinated research efforts of individuals and/or groups, both within individual states and within the Nation.

498 pages. \$6.23. MicA 55-2011

#### MANAGEMENT AND THE UTILIZATION OF THE OLDER WORKER

(Publication No. 12,629)

Arthur Jerome Noetzel, Ph.D.  
University of Michigan, 1955

This study describes and comments on the endeavors of a number of companies to solve problems relating to their older workers. Against the background of the current literature, it reports and analyzes information, obtained

from 140 companies by interview and correspondence, concerning the selection, placement, reassignment, medical supervision, and retirement of older employees. It is a qualitative, not a statistical, study seeking to determine the factors involved in making managerial decisions concerning this group of employees.

Management is interested in this problem because the median age of the labor force is increasing; the average span of years between the termination of work and the date of death is lengthening; and interest in the establishment of corporate-financed pension plans is continuing. Company executives realize that aging is accompanied by physical, psychological, and social changes which influence the older worker's work performance and adjustment to retirement.

Variations between companies in their policies and practices concerning the utilization of older workers result from differences in managerial beliefs and attitudes, company traditions, union-management relations, the number and variety of jobs, the physical environment of work, the rate of company growth, and management's confidence in the ability of the Nation to maintain full employment.

From an analysis of the data on company activities in this area of personnel administration, the following general conclusions may be drawn. Personnel officials very frequently define aging in terms of physical deterioration. The aging process produces asymmetrical effects within a work group and tends to increase individual differences. Many personnel actions, especially retirement, produce effects extending beyond the work place into the community-life of the employees. There is a growing awareness that chronological age is a weak norm of personnel action, but a more satisfactory criterion has not been uniformly accepted by industry. For these reasons, industry will probably become increasingly concerned with medical programs of a more comprehensive character than those presently established and with the socio-psychological aspects of aging. Finally, the key factors determining company policy concerning the utilization of older workers are: (a) the company's prospect for growth and stability; (b) management's view of the proper balance between individual and group procedures for solving the problems of older workers whenever difficulties arise in their work or retirement; and (c) management's conception of the manner in which the total responsibility for the older worker should be divided among the older person himself, the company, and various social agencies.

453 pages. \$5.66. MicA 55-2012



SELECTION AND USE OF CERTAIN  
FACTORS SIGNIFICANT IN PREDICTING  
ACHIEVEMENT OF STUDENTS IN  
FIRST-SEMESTER ACCOUNTING AT  
THE UNIVERSITY OF MIAMI, 1950-1953

(Publication No. 13,228)

John Everett Royer, Ed.D.  
Indiana University, 1955

Chairman: Elvin S. Eyster

This problem is a study of the relationship between selected factors and scholastic achievement in first-semester accounting for students at the University of Miami during the period 1950-1952 and of the use of certain of these factors for predicting achievement of a subsequent group of first-semester accounting students during the period 1952-1953.

#### Procedure

Selection of factors to be used in this study was made by examining the findings of other investigators to learn which factors they had determined to be highly related to achievement in a skill subject. Also, faculty members of the accounting department at the University of Miami were consulted as to which factors they believed had some influence on achievement in first-semester college accounting. The three classifications of factors for the 1,234 students in the base group were: (1) ability test scores, (2) personal factors concerning the student, and (3) personality traits of the student. Ability test scores were taken from freshman placement tests and from a special Arithmetic Test which was administered by instructors in first-semester accounting. Data on personal factors were obtained from personal data sheets filled out by the students and from high school and college transcripts. Ratings of 10 personality traits had been made by the principal of the high school from which the student graduated.

Relationships between ability test scores and achievement in first-semester accounting were determined by product-moment correlation. Chi-square and the mean square contingency were used to determine relationships of personal factors and personality traits to achievement. A weighted value, assigned to each personal factor and personality trait that was highly related to achievement in first-semester accounting as determined by Chi-square and mean square contingency, was used in the computation of separate composite scores of personal factors and personality traits.

#### Summary of Findings

Although a number of ability test scores were studied, only three were selected for use in predicting achievement in first-semester college accounting: A.C.E. Quantitative score, A.C.E. Linguistic score, and Arithmetic Test score. Of the 26 personal factors studied, eight were selected for inclusion in a composite score; and of the 10 personality traits, nine for another composite score. In order of importance in relation to achievement, the three ability test scores and the two composite scores were: Arithmetic Test score, composite score of personal factors, A.C.E. Quantitative score, composite score of

personality traits, and A.C.E. Linguistic score. Test of the interrelationships among these data by means of partial correlation revealed the extent to which that same relationship was reflected in part between achievement and others of the variables used. Ranked in order by degree to which they measured influences common to other factors, these variables were: A.C.E. Linguistic score, composite score of personality traits, A.C.E. Quantitative score, Arithmetic Test score, and composite score of personal factors. Multiple correlation between achievement and these five variables yielded a larger coefficient than any combination of fewer variables. When the regression equation developed from the multiple correlation analysis was applied to a subsequent group of students, the results were moderately successful. Prediction of achievement marks was accurate within one letter mark for approximately two-thirds of the group.

#### Implications

Although achievement marks cannot be predicted with certainty, some students at the University of Miami may be encouraged to pursue an accounting major because of their probability of success as indicated by the prediction equation. Other students, while not to be encouraged to major in accounting, should not be discouraged from taking first-semester accounting. However, these students should be warned of their probability of failure in first-semester accounting until certain remedial work intended to increase the probability of success in accounting has been completed.

293 pages. \$3.66. MicA 55-2013

#### THE ECONOMIC AND SOCIAL SIGNIFICANCE OF CERTIFICATION MARKS

(Publication No. 12,653)

Donald Arthur Taylor, Ph.D.  
University of Michigan, 1955

Certification marks are a relatively new technique used in the marketing of consumer goods and services. The position of the certifier as an impartial third party suggests that such marks may aid the consumer in overcoming the problems of product selection. The specific purposes of this study are as follows:

1. To determine the extent and manner of use of certification marks.
2. To evaluate the organizational framework within which certification marks are used.
3. To determine the way in which certification marks may aid the consumer in overcoming the problems of product selection.
4. To develop some principles which may aid the seller in determining when to use and how to use certification marks.

The analysis of extent and manner of use is based upon information concerning the objectives and administrative arrangements used by one hundred and thirty-four certifying agencies, constituting about seventy-five per cent of

the one hundred and seventy-five agencies owning two hundred and twenty-four marks identified for purposes of this study.

The activities of the certifying agencies are evaluated with respect to whether achievement of the objectives within the given administrative arrangement used aids the consumer in overcoming the problems of product selection. A further evaluation was made of the legal framework governing their use. Through an examination of pertinent legislation and judicial proceedings, the legal rights of the certifier and of the consumer are established, as well as the extent to which the law is administered in their interest.

Through combining a knowledge of the problems of product selection which consumers face in the market place and a knowledge of the activities of the certifying agencies, an attempt is made to deduce the circumstances under which consumers would be likely to use certification marks. Although there is no empirical evidence to support the hypotheses derived, a method is suggested for investigating the way in which the presence of certification marks influences believability in advertising copy.

The analysis of the way certification marks may be used by the seller is limited to the use of such marks in advertising copy. Through combining a knowledge of the circumstances under which certification marks may aid the consumer and a knowledge of the activities of the certifier, principles to aid in more effective use of certification marks are developed.

The following conclusions can be drawn from the study:

1. As of December 31, 1953, about two hundred certification marks were owned by eight different types of institutions using numerous administrative arrangements with respect to the source of specifications, testing for conformance, and marketing.
2. In almost every case analyzed, attainment of the objective would aid the consumer in overcoming the problems of product selection; however, the end result, in some instances, is impossible to ascertain. In approximately seventy per cent of the agencies analyzed, the administrative arrangements used are such that the consumer may place confidence in the mark. Although the law protects the rights of the certifier and the consumer, the rights of consumers could be more adequately provided for through more careful administration of the law.
3. Although certification marks may have universal application in the sale of consumer goods and services, their value to consumers in overcoming the problems of product selection is greatest in those problem solving situations in which ends are known and means are unknown.
4. Certification marks may be used more effectively in advertising copy if they are used to certify only those product attributes which may be measured and which stimulate buying motives operative in the purchasing situation.

428 pages. \$5.35. MicA 55-2014

## ECONOMICS, FINANCE

### A COMPARATIVE STUDY OF THE RISK OF LOSS ON THE LOANS OF CONSUMER FINANCE COMPANIES AND THE LOANS OF COMMERCIAL BANKS

(Publication No. 13,100)

Henry Ira Kester, Ph.D.  
Northwestern University, 1955

This study measures the lending losses of consumer finance companies and appraises their role in the public regulation of this business. The study also investigates these losses as a cost of operation and their influence on the raising of capital.

The substance of the investigation is four comparative studies. The consumer finance companies in Illinois, Wisconsin, New York and Virginia represent the loss experience in this industry. The loss record in each state is compared with the losses on loans of the member banks of the Federal Reserve District in which each state is located. The loss experience of the consumer finance industry from state to state is also compared in the study. In each case, the data on losses used cover the complete period that they are reported on a suitable basis for comparison with the losses on loans of the commercial banks. The periods analyzed are 1931-1952, 1934-1952, 1933-1952 and 1935-1952 for Illinois, Wisconsin, New York and Virginia, respectively.

Two criteria are used in the analysis of the cases to determine the degree of risk, or uncertainty, to which capital has been exposed in the lending operations of the consumer finance companies and the commercial banks. First, the gross and net losses relative to loan balances for both lenders are compared. The characteristics of the gross and net loss ratios, as well as their components, are analyzed critically to show the variation of the losses on loans in both the short and long run. The method of analysis relies more on reasoned judgement as opposed to the blind and rigid use of statistical devices. The second criterion is the capacity of each lender to absorb losses due to the non-payment of loans. The cost of borrowed capital and gross losses combined are related to the net current earnings of each lender as the first measure of the ability to absorb losses. The second measure is the gross losses relative to capital accounts, and it is used in the three cases where data are available for capital accounts. The influence of losses on the financing of the consumer finance industry is the final area of analysis in the cases.

The findings indicate that, as compared with the commercial banks, the losses on loans of the consumer finance companies have tended to be the more stable. Losses on loans tended to vary inversely in both the banks and the consumer finance companies with changes in general business conditions. However, the net loss ratios of the consumer finance companies did not vary over as wide a range as general business conditions changed from depression to prosperity. The level of losses tended to be considerably higher in the case of the consumer finance companies. However, barring drastic regulatory changes in the industry try, the average net loss ratios of the consumer finance companies tended to be the more representative of the normal losses to be found in the business in both the short and long run.



The consumer finance industry also has had the more consistent capacity to absorb losses due to the non-payment of loans. Losses on loans were adequately covered by net current earnings in the small loan business in every case barring those years when consumer credit restrictions were placed on the industry. The consistent capacity of the consumer finance business to provide adequately for losses on loans was the most important reason to suggest that capital in the consumer finance industry has not been exposed to an unusual hazard of loss over the long run.

286 pages. \$3.58. MicA 55-2015

GOVERNMENT LENDING AND LOAN  
GUARANTEE PROGRAMS AS  
INSTRUMENTS OF ECONOMIC STABILIZATION

(Publication No. 12,626)

Frank Eugene Morris, Ph.D.  
University of Michigan, 1955

The purpose of this study is to investigate the potential usefulness of government lending and loan guarantee programs as instruments of economic stabilization. The merits and weaknesses of lending and loan guarantee programs (as compared to alternative stabilization instruments), the major problems to be encountered in their application and the limitations on their effectiveness are explored.

Part I of the study deals with the principal issues involved in the use of government lending and loan guarantee programs as stabilization instruments. The approach in Part I is largely abstract and theoretical. Part II consists of an investigation into the peacetime business lending and loan guarantee experience of the Reconstruction Finance Corporation for the purpose of testing the conclusions of Part I in the light of the history of that organization.

The study has three principal conclusions, all of which are supported, in whole or in part, by the experience of the Reconstruction Finance Corporation:

(1) Lending and loan guarantee programs would seem to be reasonably well-adapted for service in combating moderate cyclical fluctuations in income and employment. They have a number of qualities which would commend them for such use, including their low cost in terms of net governmental outlay per unit of income generated. They are not sufficiently potent instruments, however, to deal effectively with severe cyclical fluctuations or a situation of secular stagnation.

(2) Unlike the traditional, indirect monetary controls, which function through changes in the general level of interest rates and the general availability of credit, most lending or loan guarantee programs would function through altering the structure of interest rates and the relative availability of credit to different classes of borrowers. In general, the effects of such programs would be to make credit more readily available to the middle groups of borrowers (from the standpoint of credit-worthiness) relative to the groups of borrowers in the strongest and those in the weakest credit positions. This alteration in the structure of rates might be justified, to some extent, on the ground that it would help to offset certain imperfections in the capital markets which give the large and the well-established firm an uneconomic advantage in raising capital.

(3) Loan guarantee programs were found to be superior to direct lending programs for a number of reasons. Loan guarantee programs influence but do not displace market determinations in the allocation of credit; they are more flexible in operation and entail much lower administrative costs. In addition, for institutional reasons, loan guarantee programs are, potentially, more powerful instruments than direct lending programs. The basic reasons for their greater potential is that a government agency is less vulnerable to criticism and, hence, should be in a position to follow bolder policies, when it can restrict itself to the establishment of broad policy lines and can delegate the task of choosing between particular would-be borrowers to private lenders. For these reasons, it is concluded that direct lending programs should be employed only when inadequacies in the cooperating private lending institutions would prevent a loan guarantee program from fulfilling the goals of public policy. 338 pages. \$4.23. MicA 55-2016

THE DEVELOPMENT OF A GENERAL  
QUASI-REORGANIZATION CONCEPT

(Publication No. 12,642)

James Schwartz Schindler, Ph.D.  
University of Michigan, 1955

This dissertation is a study of a procedure, entitled a "quasi-reorganization," whereby a continuing enterprise could establish a new basis of accountability for its financial statements without formal court proceedings or creation of a new legal entity. The significance of the study arises from an increased recognition of the limitations inherent in current generally accepted accounting principles and the need to consider alternative proposals to provide flexibility rather than a rigid adherence to an historical cost basis. The purposes of the study are: (1) to develop a general quasi-reorganization concept for all conditions which might lead to a change in basis of accountability; (2) to present alternative standards and procedures and to indicate those most consistent with the general concept; (3) to provide an adequate basis for interested parties to appraise the relative advantages and limitations of the concept as well as the inherent problems in effecting it.

A review of the accounting literature and corporate statements related to the write-up movement of the 1920's and the write-down movement of the 1930's provided an historical perspective of the objectionable reporting in these periods and a basis for the proposal of improved procedures. The development of a limited quasi-reorganization procedure by the American Institute of Accountants and the Securities and Exchange Commission, likewise, was discussed as an antecedent of the general concept.

The development of the general concept and the related standards and procedures was divided into asset and equity phases. The subsequent determination of income was included within the discussion of the equity accounts. The presentation of asset accounts included the following: a definition of an asset for accounting purposes; alternative value concepts; a proposed value concept; valuation procedures to implement the value concept; the resources to be revalued; the specific asset restatements; and adequate

disclosures. The presentation of equity accounts included the following: the nature and significance of equity representations; existing authoritative equity reporting principles; corporation code provisions; income tax laws; requirement of stockholder consent; accounting for subsequent transactions with equity holders; and disclosures in financial reports.

It was proposed that an "investment accountability" be established for all values entrusted to management. This required determination of total enterprise value. An "income accountability" would be attained by valuation of specific assets in accordance with a "going-concern replacement cost basis" which would provide for consistent subsequent income determination as well as comparability with the reporting of competitors. A resulting differential valuation would be recognized and amortized against income. It was proposed that all creditor and stockholder interests be valued and classified as contributed capital. A new dated retained income account would be initiated. Subsequent interest charges and income taxes would be computed consistently with the restated asset and equity accounts.

The proposed general concept is a composite of a group of standards encompassing a complete change in basis of accountability. Even though the general concept may not attain widespread acceptability for application in its entirety, it provides a basis for judgment of the significance of alternative procedures. Further, the concept is deemed to have significance in other areas wherein a revised basis of accountability is proposed. The writer concludes that procedures based upon the general quasi-reorganization concept would elicit widespread agreement among interested parties and become eligible for admittance to the body of generally accepted accounting principles.

509 pages. \$6.36. MicA 55-2017

## ECONOMICS, HISTORY

### THE ECONOMICS OF FRUIT-GROWING IN NEW YORK STATE

(Publication No. 12,702)

James Edward Kenney, Ph.D.  
Syracuse University, 1955

This is primarily a regional study, designed to bring together the data necessary for an appraisal of the economic significance of fruit-growing as a segment of the agriculture of New York State, to examine fruit-growing as an illustration of economic specialization, and to ascertain the principal factors conditioning the development of fruit-growing in New York, with a view to anticipating its future prospects.

Although agriculture has been steadily declining in importance as an economic activity in New York, with a constantly diminishing farm population and a smaller land area under cultivation, the State still maintains a leading position in the Nation as a producer of certain agricultural products. Included among these products are various fruits, such as apples, cherries, grapes, peaches, pears, strawberries, and raspberries.

The State of New York has certain advantages in fruit-growing, particularly its climate and populous markets. Over the years, fruit-growing in this region has undergone many changes. It has become commercialized. It has settled into a definite geographical pattern. It has encountered and solved many problems of production. Although the industry is still beset with difficulties, attempts are being made to overcome them.

The most important fruit crop in New York is apples. Next in importance are cherries and grapes.

Except for cherries, the production of fruits in New York has shown an overall decline in amount. The output of pears, in particular, has fallen very rapidly, due primarily to an ineradicable disease. However, prices for these fruits have shown a general tendency to rise.

Recent consumption trends indicate that American consumers are using more processed fruit. This trend has affected the New York fruit industry.

A chief problem in fruit-growing is the cost of production. The cost of growing fruit has been increasing, in some cases rapidly. The main item in production cost is labor.

Fruit-growers are attempting to counteract rising costs by means of achieving greater efficiency and mechanizing orchard operations. Recently, attempts are being made to improve the marketing of fruit crops.

Fruit-growers are interested in the factors which determine the price of their products. Numerous studies have examined possible factors determining the prices of apples in particular. The general conclusion is that apple prices are determined by the size of the crop and the buying power of the consumer.

Fruit-growers are able to derive supplementary income from non-fruit agricultural activities and from off-the-farm employment.

The government has done much to help the fruit industry through programs of surplus removal, information services, public institutions, and similar activities. The government has also in some cases imposed rules and regulations on the fruit industry.

The conclusion of this study is that fruit-growing will at least remain an important segment of New York agriculture, and may under certain conditions become even more significant in the years ahead.

303 pages. \$3.79. MicA 55-2018

### THE NATIONAL ASSOCIATION OF LIFE UNDERWRITERS: ITS FIRST FORTY YEARS (1890-1930)

(Publication No. 11,949)

Harris Proschansky, Ph.D.  
New York University, 1954

Adviser: Professor Ralph W. Hidy

The National Association of Life Underwriters is the largest life insurance agents' organization today. Founded in 1890, it was an outgrowth of the successful association movement of the 1880's, which in turn had profited from the mistakes of unsuccessful agents' groups during the 1870's.

The NALU's main functions in its early years were to



combat rebating (returning a portion of the premium to the policyholder), twisting (inducing a policyholder to change his policy from one company to another), slander of other companies, and operations of fraudulent companies. The cutthroat tactics of competing companies after the Panic of 1893 precluded any substantial improvement by the national body of marketing practices; it also was the principal cause for the failure of the NALU to curb the harmful activities of fraudulent companies. In spite of these failures, the NALU goaded the companies into adopting an anti-rebate compact which was in existence from 1895 to 1899. While unsuccessful in accomplishing its objectives, the compact paved the way for successful collaboration among companies relative to elimination of insurance misdemeanors in later years. The association movement by 1905 had persuaded a majority of the states to approve anti-rebate legislation. It had also successfully opposed taxation of insurance.

The dissatisfaction of many of the members with the curbs on discussion forced a democratization of the NALU. At its lowest ebb during the years 1894 through 1898, the organization made a quick recovery in 1899, after affording its members more opportunity to voice their opinions at conventions. At first completely under the sway of the general agent, the national body witnessed the rise of the sub-agent within its ranks after 1910, a development which made for increased democratization of the society.

The Armstrong Committee hearings of 1905 in New York had a sharp impact upon the NALU. The testimony at hearings relative to the widespread practice by agents of rebating, twisting, and slander of rival companies was disturbing to the members of the national agents' body, who realized that the organization had failed to halt socially undesirable practices.

One immediate reaction bore upon the welfare of the agents themselves. While approving much of the restrictive legislation recommended by the Armstrong Committee, the national society successfully persuaded state legislators to reduce the limitations proposed by the Committee on compensation of solicitors.

To aid in restoring the shaken confidence of the American people in life insurance, during the second decade of the century the companies and the NALU conducted institutional advertising, informed marketing, and conservation campaigns. Institutional advertising can be defined as that stressing the value of the business as a whole rather than the achievements of a particular company or individual. The means for institutional advertising that the NALU employed included newspaper advertisements, special meetings, lectures, use of radio, essay contests, and reprints of talks by prominent individuals on topics pertaining to life insurance. The NALU actively participated in the informed marketing movement, the aim of which was to foster the better selection and training of agents. The national agents' body, in co-operation with local associations, interested colleges and universities in giving courses on insurance. It also actively supported such schools of life insurance salesmanship as the Carnegie School. It was a principal factor in the founding, in 1927, of the American College of Life Underwriters, which conducts examinations leading to the Chartered Life Underwriter (CLU) designation. The dual aims of the conservation movement were to reduce mortality and to prevent lapsation of policies. In the following decade, the national society's interest in conservation declined, although it continued to be quite active in the other two campaigns.

Other measures of the NALU also contributed to the return of public confidence. After 1905 the national agents' group intensified its efforts to eradicate insurance misdemeanors through appropriate legislation and continued its fight against taxation of life insurance. It also lobbied on many other subjects. NALU members participated in successive Liberty Loan campaigns during World War I and attempted to interest soldiers and veterans in the life insurance business. The events of the war era accelerated desirable trends within the industry and, in particular, within the national society.

Between 1870 and 1929 the NALU took a prominent part in the professionalization of life insurance selling. The informed marketing movement helped to develop a better-trained agent. The Association continually strove to encourage better ethics among agents. Notable steps in these directions were the informed marketing movement, the Chart of Ethics adopted in 1918, and the founding, with NALU encouragement, of the American College of Life Underwriters. The successive institutional advertising campaigns referred to the advantages of life insurance selling as a profession and pointed to the growth in prestige of the agent.

In these ways the organized agents' groups, particularly the NALU, materially contributed to the restoration of confidence in life insurance and expansion of sales. They steadily hammered home the vital message of life insurance and aided in no small degree in convincing the public that life insurance was indispensable. Thereby, the national agents' society contributed to the growth of one of the greatest and largest financial institutions in the United States.

300 pages. \$3.75. MicA 55-2019

## ECONOMICS, THEORY

### KEYNES AND HIS UNDERCONSUMPTION PREDECESSORS

(Publication No. 12,692)

Maurice Mann, Ph.D.  
Syracuse University, 1955

The economics of John Maynard Keynes did not just happen. Strong and sophisticated antecedents of the Keynesian analysis of aggregate demand and economic intervention can be found in the writings of the following underconsumption theorists: Lord Lauderdale, Simonde de Sismondi, Thomas Robert Malthus, and John A. Hobson. Consequently, since there exists a distinct relationship between Keynes and his predecessors in these areas, Keynesian economics is the culmination of an evolutionary process.

Keynes and his underconsumption predecessors were primarily concerned with the prevention, or at the least the alleviation, of the recurring periods of crisis and depression within the private enterprise economic system. These theorists argued that the main cause of periodic declines in the level of economic activity is a level of aggregate demand insufficient to maintain a full employment level of national income. It is true that the emphasis in the writing of each was placed upon slightly different

factors: Lauderdale forcefully opposed parsimony; Sismondi referred to the inadequacy of national income; Malthus spoke of the failure of effective demand; Hobson stressed the disproportion between spending and saving; and Keynes focused his attention upon the deficiency of aggregate investment spending. Yet, the end-product was generally the same: An inadequate level of aggregate demand provokes economic crises and their accompanying unemployment.

According to the underconsumptionists, the failure of the economic system to achieve a full employment level of equilibrium can be explained by the implications of saving. For them saving, since it is carried on at the expense of consumption, is the root cause of crises and depressions. All saving is considered to be deflationary. For Keynes only that saving which is not invested is considered to be deflationary.

It is here that Keynes made his greatest contribution to the development of the underconsumption standpoint. He separated saving and investment into two distinct processes which are carried on by different people and for different reasons, while at the same time posing the equality of saving and investment, *per definitionem*. Also, he divided aggregate demand into consumption expenditures and investment expenditures.

Consequently, Keynes served to refine the underconsumption approach. The underconsumption analysis can be incorporated in the Keynesian system. It is found that a level of investment expenditures insufficient to maintain an

adequate level of aggregate demand can be attributed to a too low propensity to consume. If the ratio of consumer spending to saving which is compatible with full employment is not in force, the level of investment expenditures needed to maintain or encourage a full employment level of income will not be forthcoming.

For the prevention or alleviation of this recurring ill of the private enterprise economic system, Keynes and his underconsumption predecessors turned to economic intervention, i.e., partial governmental economic planning. Each of these theorists was firm in remaining within the capitalist system; none advocated any measure particularly abusive to the institutional fabric of the economic system. It is significant that each regarded an undirected and unregulated economic system as being unable to prevent recurring crises and depressions.

The long-run consequences of the economics of Keynes and of his underconsumption predecessors are the variegated planning programs instituted by the economies of the Western world. Fiscal policy and monetary policy have become the most important weapons in the arsenal of the private enterprise economies in the struggle against unemployment and economic inactivity. In mature economies, the implementation of policy measures designed to increase the availability of consumer purchasing power represents the sum and substance of contemporary public policy. This signifies a tribute to the underconsumptionists which even the most enthusiastic Keynesians must acknowledge.

304 pages. \$3.80. MicA 55-2020

## EDUCATION

### EDUCATION, GENERAL

#### AN ANALYSIS OF THE GUIDANCE ORGANIZATION AND SERVICES IN THE COMMISSIONED INTERMEDIATE SCHOOLS OF INDIANA

(Publication No. 13,208)

A. Dale Allen, Ed.D.  
Indiana University, 1955

Chairman: Professor Howard T. Batchelder

#### PURPOSES

The major purposes of this study were: (1) to analyze the organizational patterns of guidance in the commissioned intermediate schools of Indiana; (2) to determine the various services offered in the guidance program; (3) to determine problems and recent and anticipated changes in organizational patterns and services of guidance; (4) to determine techniques used in appraising the guidance program, the acceptance of certain basic principles of guidance, and the degree of attainment of those principles in the schools; and (5) to bring together authoritative evaluative criteria on the various phases of guidance and the data in this study in an attempt to interpret and appraise the findings in the study in the light of these criteria.

#### METHOD OF INVESTIGATION

One hundred per cent of all commissioned intermediate schools of Indiana - junior high schools comprising grades 7 and 8 - participated in this study. Adopting the normative-survey approach as the research method, the investigator employed two instruments - an interview guide and a check list of guidance principles - in collecting the data for the study. During the personal visits to each of these schools, guidance data were obtained through interviews with administrators, teachers, and pupils, and, in order to give greater validity to these findings, cumulative records and schedules of classes were examined and other supporting data in the form of duplicated guidance materials were obtained where available.

#### FINDINGS AND CONCLUSIONS

The 31 participating schools had a median enrollment of 350 pupils and a median of 17 faculty members. It was found that guidance committees existed in 32 per cent of the schools and counselors were used in 39 per cent.

The guidance approaches of greatest importance were homerooms, incidental guidance in regular classes, and individual and group counseling. Homerooms averaged from 30 to 34 pupils and were in session most frequently during the first period of the day, and alphabetical grouping was the main practice followed in assigning pupil personnel to homerooms. Guidance courses were taught in 16 per cent of the schools.



Only one fifth of the schools scheduled individual conferences for all pupils and a like number of schools made a follow-up of drop-outs. Every school maintained a cumulative record system, and standardized tests were administered and used in most of the schools. The large number of recent major changes made in the guidance program and the numerous changes anticipated indicated that services were being extended and increased. An in-service guidance program for teachers existed in over 70 per cent of the schools.

Evidence shows that guidance is recognized as a major function in the school program, and provisions for guidance services are being extended and increased. Findings reveal that personnel participating in the planning of guidance varies greatly within the schools, and that homerooms play an important role in administering guidance services. The greatest handicap lies in the lack of guidance personnel and/or sufficient time for such personnel. Available specialists are inadequate.

Group guidance services more nearly approaching recommended practices are found in orientation, citizenship, physical health, educational guidance, and audio-visual materials, while types of pupil information most available for use are basic family information, attendance records, health records, reports of failures, and testing records. Appraisal studies conducted within the intermediate schools are inadequate. Evidence reveals that most of the participating intermediate schools are making substantial progress in developing effective guidance services.

In general, the findings of the study reveal that the guidance programs in the intermediate schools of Indiana are being administered in accordance with standards recommended by authorities in the field of guidance.

301 pages. \$3.76. MicA 55-2021

THE PROBLEM AREAS OF A  
SELECTED GROUP OF STUDENTS  
AT FLORIDA STATE UNIVERSITY  
AS INDICATED BY THE MOONEY  
PROBLEM CHECK LIST

(Publication No. 13,214)

James Francis Carr, Jr., Ed.D.  
Indiana University, 1955

Chairman: Robert H. Shaffer

Statement of Problem

The purposes of this study were to ascertain the problems of a selected group of superior and inferior college students in each of the 11 areas of the Mooney Problem Check List and the relationship between these groups, and to evolve conclusions from the findings which will make it possible to work more intelligently with the problems of superior and inferior students.

Superior students were defined in two ways: those undergraduate students whose scholastic achievement was in the highest 10 per cent of the student body as determined by grade point average; and those students who had percentile scores on the American Council on Education Psychological Examination in the highest 10 per cent of their entering class; while inferior students were defined as those

undergraduate students in the lowest 10 per cent in each of these respects.

Sources of Data

The 300 students selected were undergraduates enrolled at Florida State University for the first semester of 1951-1952. Data were secured by means of the Mooney Problem Check List and official University records. The personal background and other pertinent information were secured from the Office of Personnel Records and the University Registrar.

Findings and Conclusions

The findings apparent from the data were:

- (1) The inferior group contained almost twice as many students from rural areas as the superior group.
  - (2) Inferior students, as a whole, came from larger families.
  - (3) Superior students came more frequently from the larger high schools.
  - (4) Among the superior students there was a decided preference for the College of Arts and Sciences.
  - (5) The inferior student was enrolled more frequently in the School of Education or the School of Business.
  - (6) Superior students as a group had fewer problems than inferior students.
  - (7) Superior students indicated as many or more problems than inferior students in seven of the 11 areas of the Mooney Problem Check List.
  - (8) The greatest difference between the groups was in Area IX, Adjustment to College Work.
  - (9) In a comparison of the total possible problems indicated in Area IX, Adjustment to College Work, superior ACE and inferior ACE students and superior and inferior students selected because of their grade averages, there existed a significant difference in each comparison at one of the selected levels of confidence.
  - (10) Superior students who participated because of ACE scores indicated more problems on the Mooney than inferior ACE students.
  - (11) The problems most often identified by superior students were those of a general nature whereas those most often marked by inferior students were those having reference to academic adjustment.
  - (12) There was a gradual decline in the percentage of problems indicated from the freshman through the senior year when superior and inferior students were compared by classes.
- The major conclusions seem to be:
- (1) The superior students tended to be more concerned with problems relating to long-range goals and objectives and less concerned by problems relating to immediate goals.
  - (2) Both superior and inferior students were inclined to identify more problems in areas relating to personal and social adjustment than in areas relating to religion, philosophy, and heterosexual relationships.
  - (3) Inferior students appeared to understand many of the reasons for their poor academic adjustment.
  - (4) Inferior students were better able to make adjustments in areas involving social activities and social-psychological relationships than superior students.
  - (5) The superior students selected because of their

grade point averages indicated better adjustment than superior ACE students as revealed by their consistent checking of fewer problems in all areas of the Mooney.

(6) In general, successful completion of each succeeding year in college tended to be reassuring for both groups of students. 202 pages. \$2.53. MicA 55-2022

**AN ANALYSIS OF SELECTED FACTORS  
IN THE SOCIO-ECONOMIC AND  
OCCUPATIONAL EXPERIENCE  
BACKGROUNDS OF DISTRIBUTIVE  
PERSONNEL IN LIMITED-LINE STORES**

(Publication No. 13,329)

Peter George Haines, Ph.D.  
University of Minnesota, 1955

**The Problem**

What are the people like who distribute goods in retail stores? While techniques of job analysis and job specification may provide part of the answer, in terms of what retail personnel must know and do, effective selection and training techniques in business and distributive education would seem to depend upon more adequate determination of the groups of personnel to be served.

The problem of this investigation was stated in two parts:

1. Are there significant differences in the occupational experience and socio-economic backgrounds of retail personnel as sampled in two cities, and secondarily,
2. Do such differences, if any, suggest the desirability of changes in present practices in guidance and training to further the effectiveness of distributive and business education?

Several null hypotheses were used to specify the problem, testing samples of personnel classified by job level, merchandise line, city of employment, sex, and type of store ownership. A secondary problem manifested itself as a problem in research design applicable to the complex structure of the marketing field to determine useful sampling methods and techniques of statistical analysis.

The purposes of the study were:

to illustrate research design applicable in similar studies of personnel and to appraise the differences in background upon several aspects of the distributive education program-coordination techniques, guidance, and curriculum.

**Procedures**

The population was construed as composed of a series of strata in time. In the strata samples were personnel defined as active owners, managers, and salespeople whose place of business was a limited line store, carrying a primary merchandise line of furniture or men's or women's apparel, and operating within Mason City or Waterloo, Iowa.

A personal interview was used to secure the data and a standard punch-card machine tabulation method was employed.

A non-parametric test of significance, the H-test,

developed by Kruskal-Wallis was found to be useful in this type of analysis because of its simplicity and use of ranked data.

**Findings of the Study**

Six hypotheses were tested:

1. Personnel in Waterloo, regardless of job level or other classification, were found not to be different than personnel in Mason City except relative to the factors of age and educational achievement.
2. There were no significant differences between personnel within Mason City when such personnel were classified by job level and kind-of-business.
3. There were no significant differences between personnel in Waterloo when classified as in (2).
4. Male personnel were found to be significantly different from female personnel for a majority of the factors of background tested.
5. Owner-managers were found to be not significantly different from salespeople for most factors of socio-economic background, but more frequently different in the case of factors associated with job stability and migration.
6. It appeared that chain store personnel were significantly different from independent store personnel although for many factors the hypothesis remained in doubt.

**Major Conclusions**

Since the personnel in sub-groups manifested diversities in background, the design of future experiments or investigations embracing retail personnel must be carefully structured to avoid masking important differences by the homogeneity of broad classification factors.

Additional emphasis needs to be placed upon devising methods of providing occupational competency that are peculiarly suited to the small high school. Training is a regional problem since personnel migrate in substantial numbers from their native communities.

The values of occupational experience and vocational instruction at the secondary level may be judged by the early occupational choice and job stability demonstrated.

There appears need for substantially greater guidance of individuals who will succeed to retailing but who attended schools of very limited enrollment and for whom instruction was solely college preparatory in nature.

240 pages. \$3.00. MicA 55-2023



**THE DEVELOPMENT OF CRITERIA FOR  
AN EVALUATION OF THE SUPERVISORY  
PROGRAM IN THE SCHOOLS  
OF ALTON, ILLINOIS**

(Publication No. 12,803)

James Burris Johnson, Ed.D.  
Washington University, 1955

Chairman: Elmer James Reynolds

A dissertation designed to develop criteria for an evaluation of the supervisory program in the schools of Alton, Illinois.

The criteria were developed from two sources:

1. A frequency tabulation showing the opinions of the authors quoted in the study.
2. High-ranking opinions of 444 participants as expressed on a validated questionnaire circulated according to the normative survey plan.

Four groups were asked to evaluate the items included in the questionnaire:

Group	Number of Participants
1. Educational specialists	32
2. Madison County administrators	29
3. Alton administrative staff	35
4. Alton teachers	348

There was concordance concerning the opinions expressed on the questionnaire.

Six general criteria were developed from the educational literature. They dealt with plans for:

1. adequate academic, vocational, and co-curricular educational programs, and the selection and use of teaching aids and materials.
2. curricular development, objectives, goals, methods, techniques, growth of ideas, and methods of communication.
3. democratic supervision, delegation of authority, educational research and interpretation of the educational program.
4. the needs of individual pupils.
5. in-service training of teachers.
6. teacher evaluation.

Eight specific criteria were developed from the opinions expressed on the questionnaire. They dealt with:

1. preparation, willingness, and activities of the supervisor.
2. preparation, willingness, and activities of the classroom teacher.
3. knowledge of the building principal concerning supervision.
4. definition and explanation of objectives, principles, and policies of the supervisory program.
5. educational bulletins and other aids to teaching.
6. teaching beyond the fundamental skills, i.e., developing experiences that will provide citizenship training and encourage students to accept responsibility.
7. flexible framework of the supervisory program which provides for educational planning, individual differences, and the infiltration of new ideas.

8. teacher-principal-supervisor cooperation in the total planning of the educational program.

The evidence indicated that delayed evaluation of pupils' work, a varying philosophy of education in the school system, elimination of objective tests, the delegation of all authority of the supervisor to teacher committees, and allowing pupil specialization in subject matter at the high school level of instruction were not desirable in the educational program. The study pointed to nine educational problems in the Alton schools. They were:

1. line-and-staff organization.
2. cooperative merit rating.
3. homogeneous grouping.
4. core-curriculum.
5. student opinion in regard to controversial issues.
6. orientation program for all teachers.
7. yearly revision and analysis of curriculum studies.
8. lay participation in the educational program.
9. resource units of work.

Supervisory services were found to be dependent primarily on democratic methods of supervision and an educational program which included rules, regulations, policies, methods, and techniques that were desirable in the school. The duties of the supervisor were found to be concerned with planning and providing democratic leadership for classroom instruction; thus, all the supervisory services have as their ultimate goal an instructional environment for well-developed, capable citizens in a democratic society. The methods of the study were unique and applicable for use in the schools of Alton, Illinois. However, with modification the criteria developed could be used in other school systems. 261 pages. \$3.26. MicA 55-2024

**BUSINESS EDUCATION PROGRAMS IN THE  
PUBLIC JUNIOR COLLEGES OF GEORGIA:  
AN EVALUATION WITH SPECIAL REFERENCE  
TO THE NEEDS OF BUSINESS**

(Publication No. 12,776)

Travis Kirkland, Ed.D.  
The University of Florida, 1955

**Purpose:** To determine the implications for the development of more comprehensive and effective office training programs for the junior colleges of Georgia (1) by analyzing the qualifications of office personnel considered most desirable by office managers, and (2) by studying and evaluating the adequacy of the present programs and facilities for training of office personnel.

**Methods and Materials:** Information as to the adequacy of the office training programs of the junior colleges was obtained from office managers, graduates of the office training programs of the colleges, and the teachers and officials of these junior colleges. This information was secured through the use of inquiry blanks, visits to the junior colleges, and interviews with business teachers and college officials.

**Selected Findings:** (1) Only 50 per cent of the junior college business teachers have the equivalent of one or more

years graduate training. (2) Guidance activities are carried on principally by the faculties of the respective colleges and without the assistance of specialists.

285 pages. \$3.56. MicA 55-2025

# THE EFFICACY OF THE PHYSICAL SCIENCE LABORATORY IN PROMOTING A GENERAL EDUCATION OBJECTIVE

(Publication No. 13,332)

Arnold Mathew Lahti, Ph.D.  
University of Minnesota, 1955

## Problem:

The study developed from the increasing emphasis placed upon the scientific method as an educational objective. The interest in the problem centered around the meaning of the term - the scientific method. The writer visualized the scientific method as a reorganization of knowledge which was directed toward the solution of a problem. The problem was to investigate two aspects of the scientific method, namely, the designing of an experiment to obtain data and the interpretation of the collected data.

## The Instruments of Measurement:

A written test was constructed to measure the ability of the student to design an experiment and to interpret experimental results. A Performance Test was constructed to measure the total problem solving ability. The validity of the Written and Performance Test was determined by considering the objectives being measured. The reliabilities of the tests tended to be low, although with one exception, they differentiated among individuals. The results, therefore, must be judged in terms of the low reliabilities.

## Population:

The population to which the conclusions can be generalized is the large natural science class at the University of Minnesota. The population was identified by two kinds of evidence, the similarity of external characteristics and mental ability.

## The Design and Statistics:

The design which fulfilled the requirements of a self-contained experiment was an incomplete block design. The analysis of the results was made by using intra-block information for estimating the error.

The construction of the design decided the manner in which the statistical analysis was made. The experimental data were analyzed by means of the incomplete block analysis. The assumptions underlying the mathematical model were tested. As the between blocks variation was not statistically significant, the observational data were analyzed also by the randomized block analysis. When the randomized block analysis was made the pre-test scores and the mental ability as measured by the A. C. E. Psychological Examination were equalized by means of covariance techniques. An analysis was made of the vector sum of the Written Test and the Performance Test.

## The Experimental Methods:

The experimental treatments were varied in the laboratory. Four methods of teaching the laboratory were used.

The inductive-deductive method was the problem-solving method. The historical method utilized investigations of the past. The standard laboratory was of the "cook-book" variety. The theme method used in Study One utilized the concept of energy as a unifying theme. The discussion method was substituted for the theme method in Study Two.

## The Conclusions:

The null hypothesis was accepted for the Interpretation of Data Test for Study One and Study Two. There was no significant difference among the means of methods for promoting the objective, the interpretation of data. The trend in favor of the inductive-deductive method approached significance at the 5 per cent level.

The null hypothesis was rejected for the Design an Experiment Test for Study One when the randomized block analysis was made. The inductive-deductive method produced more learning than the other methods.

The null hypothesis was accepted for the Performance Test in Study One and Study Two. The apparent differences in favor of the inductive-deductive method were not statistically significant, although the F-ratio fell just short of the 5 per cent point in Study One. The analysis of the mean scores on the pre-test and the post-test indicated that learning had occurred for each of the methods in Study Two.

The null hypothesis was rejected for the analysis of the vectorially combined Written and Performance Test in Study One. The null hypothesis was rejected for the vector analysis of the gains made in Study Two. The inductive-deductive method was best in promoting the scientific method as measured by the Written Test combined with the Performance Test. 255 pages. \$3.19. MicA 55-2026

# PRESENT AND POTENTIAL USES OF THE UNIVERSITY OF MICHIGAN CURRICULUM MATERIALS CENTER

(Publication No. 12,639)

Carol Ruth St. Cyr, Ph.D.  
University of Michigan, 1955

The purpose of this study was to determine the present and potential uses of the University of Michigan Curriculum Materials Center. More specifically, the study was an investigation of the ways in which and the extent to which this Center was of service to those presently using the materials, and the extent to which there is a demand for those instructional materials to be sent to schools throughout the State.

Secondly, the study compared the uses, potential uses, and the administrative problems of the University of Michigan Curriculum Materials Center with the uses and administrative problems of Centers operated by six other universities and colleges.

The method of investigation, employed in this study, was the interviewing of a sample of those using the Curriculum Materials Center. Those using the Center consisted of four groups: (1) student teachers of the University, (2) experienced teachers and administrators attending the University summer school, (3) teachers of the University Laboratory Schools, (4) School of Education professors.

The selection of the Centers visited in the East and Mid-west was made from the nominations obtained by



consulting six professors well known in the field of curriculum. The six Centers visited were: Teachers College, Columbia University; University of Connecticut; Boston University; University of Chicago; Northwestern University; and Iowa State Teachers College.

At the time of the interviews, the Curriculum Materials Center offered valuable and useful materials to those who had used the Center. Of the four groups interviewed the student teachers had made most use of the Center. The experienced teachers and administrators had made least use of the Center. The most frequently mentioned uses of the four groups were: for classroom teaching, for advising students, and for curriculum committee work.

In the six Centers visited it was found that approximately the same types of materials were available and the materials were generally used by the same groups as at the University of Michigan Center.

In studying the possibilities of off campus use of the Center it was discovered, from the opinions of the four groups interviewed, that they desired the Center to loan the materials to school systems throughout the State. In the six Centers, it was found that only one, the University of Connecticut, makes this service available to the schools of the State.

Policies for locating and discarding curriculum materials, a chief problem of curriculum materials centers, were studied. In general, it was found that the Center staffs had been given responsibility in these matters. In regard to discarding materials opinions varied, some believed only current materials should be kept while others were of the belief that old materials were needed for research.

In considering the location of the Center in relationship to the usefulness of having the curriculum materials and professional books accessible to one another, it was determined that a majority of the interviewees and the Centers visited did favor the two materials being conveniently located.

Two general conclusions can be drawn from the Study: (1) The University of Michigan Curriculum Materials Center was useful to individuals of all four groups interviewed, but the Center had not been used by approximately half of the potential users. Location and lack of knowledge of the existence of the Center were crucial factors in the nonuse. (2) The desire was very strong on the part of all four groups interviewed to have the Center provide off campus service. 142 pages. \$1.78. MicA 55-2027

#### LOCAL FINANCIAL RESOURCES OF SIX SOUTHERN BAPTIST COLLEGES IN TEXAS: PRESENT UTILIZATION AND SUGGESTIONS FOR FUTURE UTILIZATION

(Publication No. 13,199)

Arthur Bion Smith, Jr., Ed.D.  
University of Houston, 1955

This problem has been an investigation of the financial resources within the local areas of East Texas Baptist College, Hardin-Simmons University, Howard Payne College, Mary Hardin-Baylor College, University of Corpus Christi and Wayland College. The problem has entailed an

investigation of the economic wealth of each local area, a presentation of current sources of financial aid with emphasis on that part originating within a college's local area, and a discussion of means of better utilization of present financial resources as well as suggestions for future utilization of local area financial resources.

The investigation has been carried out through personal interviews and investigation, and a study of primary and secondary sources of information. Each school was visited. Where possible, primary sources were utilized to determine sources of financial aid and that part of financial aid which originated within the local area of each school. Personal interviews were obtained with administrative officers familiar with the financial affairs and present, as well as future, financial needs of the school. Through these methods reliable information was gathered that pertained to this problem. Secondary sources of information were utilized to obtain additional material relating to the subject that was not available elsewhere.

This investigation reached the conclusion that there were financial resources within the local area of each school sufficient to meet an increasing part of the financial needs of each school. The local areas varied in over-all prosperity but each local area had the potentialities, both present and future, to provide a larger share of the increasing financial needs of its school.

The present utilization of local area financial resources that the colleges and state denominational agencies relied on were investigated. The colleges utilized special administrative officers, field representatives, living endowment programs, ex-student solicitation, personal solicitation of local area individuals and businesses, pledges from local area Baptist churches and other means of soliciting and obtaining financial aid. Through state denominational agencies the colleges sought to reach financial resources in their local area through the Cooperative Program, the Christian Education Commission and the Endowment Department of the Baptist General Convention of Texas. The colleges among themselves had organized a Texas Baptist School Administrators Association whose partial duty was to increase financial aid to these colleges.

Suggested future utilization of local area financial resources were based on increasing population trends, human resources, expanding economic wealth, emphasizing of the colleges as service institutions and increasing numbers of prosperous families in each local area.

320 pages. \$4.00. MicA 55-2028

#### TECHNIQUES FOR STUDYING CERTAIN SCHOOL-COMMUNITY RELATIONSHIPS

(Publication No. 12,789)

Paul Paton Williams, Ed.D.  
The University of Florida, 1953

The purpose of the study was to develop and validate techniques which are adapted to large-scale use for studying certain school-community relationships. The study involved the identification and analysis of key situations which reveal significant school-community relationships, the development of techniques by which these key situations might be analyzed in such a manner as to reveal

techniques which distinguish certain school-community relationships among different school-communities and which give a maximum of accurate, usable information with a minimum use of resources.

No attempt was made to study all relationships in the school-community. The study rather concerned itself with the interaction between the school and community relating to the aspects of how the school-community learns, feels, supports, uses, and jointly participates. The study was further limited to the four school-communities studied by the University of Florida Leadership Study.

The study developed and recommended Parent and Teacher Questionnaire forms which will be used in future research by the University of Florida Leadership Study.  
293 pages. \$3.66. MicA 55-2029

## EDUCATION, ADMINISTRATION

### UTILIZATION OF PROFESSIONAL MANPOWER IN THE TEACHING PROFESSION

(Publication No. 13,202)

Paul E. Christensen, Ed.D.  
Wayne University, 1955

The critical shortage of elementary school teachers throughout the nation has directed attention to the more effective utilization of teacher time as one method of solving this problem. The purpose of this study was to examine critically the employment of time of twenty-six teachers in one elementary school with the hope that the findings would suggest ways of improving the utilization of these teachers' time and contribute to the knowledge of the work of the teacher.

Work-sampling, the method of obtaining data on the utilization of teacher time used in this study, is based on the principle of sampling by instantaneous random observations the amount of teacher time devoted to elements or activities descriptive of the teachers' overall work. A list of thirty-four elements was prepared and two observers were trained in the method of making observations using these elements. Approximately twenty thousand observations were made for a total of twenty-four days over a three-month period thought to be representative of the teachers' average work load throughout the year. After the completion of the observations, individual teacher percentages and group percentages were computed by dividing the number of observations made for each element by the total number of observations made for all the elements.

#### Conclusions

1. The method of work-sampling was adequate for the solution of the problem, easily administered, an efficient way of gathering data, and economical to administer.

2. The general principles which would apply in projecting studies of this type are:

a. The study should originate within the school itself as the result of a felt need on the part of the group and the part of the individual teacher to discover ways of

improving the utilization of their time. The full cooperation of the entire faculty is essential.

b. The teaching elements should be determined and defined for each school in which the study is to be conducted.

c. Individual teachers in a school are interested in finding out how they spend their time and it is therefore essential that an initial study be designed to present individual as well as group findings.

d. The best results from this type of study can probably occur in two ways; one, through the development of insight on the part of the individual teacher and, two, by group discussion of the group results in terms of the purposes of education in a particular school and by the implementation of improvements which occur through group action.

3. The data presented in the study indicate that:

a. The amount of time devoted to class activity, class study, and listening to recitation is noticeably different in all of the grades.

b. Clerical work accounts for a considerable portion of the teachers' time.

c. Teachers on the average spent only 25 minutes out of the total day on individual work with pupils.

d. Teachers' time was spread over a wide range of activities.

e. Almost no teacher time was devoted to conferences with pupils.

f. The presence of a considerable block of non-teaching time did not seem to result in more effective utilization of regular teaching time.

g. Two or three teachers in a group of twenty-six having unusually high or low percentages on certain elements did not affect significantly the group percentage for this element.

h. Teachers in general considered their individual reports accurate and representative of the way they spend their time.

i. There was considerable variation in the way individual teachers spend their time.

196 pages. \$2.45. MicA 55-2030

### SURVEY OF TEACHER STATUS AND COMPARATIVE ANALYSIS OF THE PROFESSIONAL AND SOCIAL PROBLEMS OF TEACHER PERSONNEL IN THE TERRITORY OF ALASKA

(Publication No. 12,980)

John Ross Cumming, Ph.D.  
University of Washington, 1955

Supervisor: Dr. George D. Strayer, Jr.

The purposes for this study were: (1) to study and evaluate the historical backgrounds of teacher personnel in the Territory, (2) to ascertain current problems in professional, social and community areas of teaching, (3) to determine the academic and professional backgrounds of Alaskan teachers to permit relative comparisons on a Territory-wide basis, (4) to make a comparative analysis of the teacher personnel in the various school systems



of the Territory, and (5) to prepare recommendations for the improvement of the teaching service in the Territory.

The historical analysis of the professional, social, and community problems of the Alaskan teacher was divided into four time-periods, a Russian Period from 1784 to 1867; a Mission Period from 1867 to 1884; a Government Period from 1884 to 1917; and a Territorial Period from 1917 to 1954. The historical study covering these four periods from Russian to the Territorial, of the academic data concerning teacher personnel in Alaska indicated that the professional qualifications of the early Russian, Mission, and Government teachers were rather low but that qualifications were increased somewhat with the establishment of certification standards during the Territorial period. The historical analysis of the professional activities indicated that there was no coordinated control or supervision of the educational programs of the Alaskan schools. Also, the high rate of teacher turnover militated against a sound educational program. The great discrepancy between the culture of the teacher and that of Alaska appeared to be the most pressing social problem of teacher personnel in the Territory.

A survey was conducted of 1266 teachers in the Territory of Alaska or approximately ninety-nine per cent of the total. Questionnaires were returned by 511 teachers or approximately forty per cent. Teacher status was studied through the utilization of the responses of the teachers in four areas, Personal Data, Academic Data, Professional Data, and Social and Community Data. A comparative analysis was made of the teacher personnel in regard to the professional and social problems for the various school systems of the Territory.

Findings of importance as a result of an analysis of the data are as follows:

1. A young teaching force is staffing the schools of the Territory.
2. The largest number of teaching positions in the Territory are filled with married teachers.
3. The majority of teacher respondents had no child dependents.
4. The spouses of teachers in Alaska tend to be engaged professionally in education.
5. The teaching staff in Alaska is well prepared academically, but approximately four out of ten teachers have not completed any professional training in education.
6. The teaching force in Alaska is inexperienced and is the product of post-war education.
7. More teacher respondents were graduates of educational institutions in the State of Washington, than from any other state.
8. The majority of men teacher respondents are teaching at the elementary level, although they were trained specifically for the high school level.
9. The tenure of Alaskan teachers does not tend to exceed three years.
10. Experienced teachers who come to the Territory to teach tend to come from midwestern States.
11. The most important motivating reason of teacher respondents for teaching in Alaska was the desire for adventure.
12. The major classroom problem in Alaska is that of dealing with the individual differences of the pupils.
13. The professional factor most dissatisfying to Alaskan teachers is the lack of adequate school facilities.
14. The most satisfying factor to teachers about teaching

in Alaska is the academic and personal freedom possible in the classrooms.

15. The majority of Alaskan teachers do not have an excessive number of pupils in their classes or extracurricular duties to perform. 627 pages. \$7.85. MicA 55-2031

# A DESCRIPTIVE ANALYSIS OF ADMINISTRATIVE PRACTICES AND TECHNIQUES IN ENGLISH SECONDARY SCHOOLS, WITH IMPLICATIONS FOR AMERICAN SECONDARY SCHOOLS

(Publication No. 12,720)

Robert Elbert Dunn, Ph.D.  
The University of Connecticut, 1955

## Statement of the Problem

The purpose of this study was (1) to describe selected aspects of the administration and program of secondary schools in England; (2) to indicate England's approach to secondary school administrative problems which also confront the United States; and (3) to show the implications for American secondary education of certain of the administrative practices and techniques observed in the secondary schools of England.

## Procedure and Method

During the 1951-52 academic year the author was in England as the recipient of a Rotary Foundation Fellowship for advanced study and travel. One of the important objectives of this experience was to acquire a thorough understanding of English secondary school administration.

As a student at the University of Birmingham, the writer was privileged to have as his adviser Professor M. V. C. Jeffreys, the Director of the Institute of Education. It was the outstanding insight and cooperation of Professor Jeffreys which facilitated the achievement of the objective stated in the preceding paragraph.

An appropriate series of lectures at the Institute of Education were attended in accordance with Professor Jeffreys' recommendations in the light of the previously mentioned objective. Correlated reading suggested by the lecturers was explored thoroughly. Frequent appointments with educational leaders on the staff of the Institute supplemented lecture and reading material because such opportunities provided occasions during which questions could be raised.

Especially significant were visits to representative types of English secondary schools where administrative practices and techniques were observed and later discussed with the headmasters.

Much of the bibliographical material needed for this study was secured from primary sources while the author was in England. Certain essential books and documents were brought home with him. A correspondence has been maintained with Professor Jeffreys and other University of Birmingham staff members and with secondary school administrators geographically scattered throughout England. These interested leaders have periodically sent pertinent literature to make possible the completion of this study.

### Conclusions

The assumption fundamental to this study was that there may be some meaning for American secondary education in the administrative practices and techniques that English educators have developed and adopted for their country.

These implications were described in the following seventeen areas of the study:

1. The role of the Ministry of Education as the central administrative agency.
2. The nature of local education authorities.
3. The means of providing adequate educational facilities.
4. The conditions governing teacher certification.
5. Regulations pertaining to the size of classes.
6. Customary practice regarding the size of schools.
7. The provision for spiritual education.
8. The Sixth Form as a means of challenging the intellectually gifted and overcoming the problem of articulation and integration.
9. The school lunch program.
10. The production of films for school use.
11. Radio broadcasting in the schools.
12. The tutorial system as a means of individualizing instruction.
13. The use of school affiliated camps as an approach to citizenship education.
14. The day continuation school as an institution designed to meet the problem of school leavers.
15. Intramural athletics.
16. The role of the headmaster.
17. The school base as a kind of campus type of secondary school construction.

It was emphasized that educational practices and techniques are not exportable commodities and that it is extremely difficult to say what is a good educational procedure except in terms of a particular society. Thus, the writer was reluctant to suggest that the administrative practices and techniques which were discussed be adopted in the United States. Rather, it is his hope that American thinking might be stimulated through indicating England's approach to secondary school administrative problems which also confront the United States.

299 pages. \$3.74. MicA 55-2032

### A STUDY TO DETERMINE THE MAJOR FACTORS WHICH INFLUENCE STUDENTS TO ENROLL AT STEPHEN F. AUSTIN STATE COLLEGE

(Publication No. 13,217)

Lawrence Turner Franks, Ed.D.  
Indiana University, 1955

### Problem

The purpose of the study was to determine the major factors which influence students to enroll at Stephen F. Austin State College, Nacogdoches, Texas. A secondary interest of the study was to establish the relationship between geography and enrollment at the college.

The study was limited to enrollment data at one institution of higher learning; by the interview technique used in

gathering the data; and by the limited amount of research directly related to the subject.

### Procedure

An interview guide sheet was developed from information collected by means of a questionnaire which contained 103 items thought to influence students to enroll at a college. The questionnaire was given to 247 freshman students in the fall of 1953. The data for the study were obtained through personal interviews with 111 freshman, sophomore, and junior students enrolled at Stephen F. Austin State College in the spring of 1954. The degree of influence of each factor was recorded on the guide sheet as follows: wholly, to a large extent, to some extent, to a little extent, and none.

The data from the interviews were tabulated and the findings shown in graphs and tables. The major factors were determined by assigning a weight to each degree of influence for each factor.

The secondary problem involved analyzing enrollment and population statistics for a twenty year period and distances from the college campus of the sixteen counties selected for study.

### Findings

Twelve factors were identified by the study as having the greatest influence on enrollment at Stephen F. Austin State College. These factors are: (1) location of college near the home of the student; (2) training offered by the various departments of the college; (3) friendly attitude of college faculty and students; (4) moderate cost of tuition; (5) former students of the college; (6) the physical plant of the college; (8) parents or guardians; (9) students enrolled at the college; (10) relatives, other than parents or guardians; (11) the scholastic standing of the college; and (12) secondary teachers.

The secondary phase of the study determined that an average of 88.7 percent of the students enrolled at the college for a twenty year period lived within a seventy-five mile radius of the college campus. A large percentage, 37.4, of the students lived in the county in which the college is located, and 33.7 percent lived in four adjoining counties.

### Conclusions and Recommendations

The following conclusions were made as a result of this study:

1. Student choice of a college results from a composite of factors.
2. Certain factors are identifiable as having more influence than others.
3. Some influences emanate from the college campus and others are constituted by factors off the campus.
4. Personal and social relations rank high in determining student choice of a college.
5. The news service, the athletic program, and the social activities program at the college had little influence in determining student choice.
6. Recruitment responsibility should be shared by every individual associated with and interested in the college.
7. Stephen F. Austin State College serves a rather limited geographic region of the state.

On the basis of the findings and conclusions listed, it is recommended that:



1. Pertinent information concerning the college be published and distributed to prospective students, parents, counselors, secondary teachers, and other former students.

2. Factors identified by the study as having little influence be carefully evaluated in an effort to increase their effectiveness.

3. Parents, relatives, and friends be invited more frequently to visit the campus.

4. A recruitment committee be established to include membership from the administration, faculty, student body, and alumni organization.

111 pages. \$1.39. MicA 55-2033

#### ADMINISTRATIVE AND EDUCATIONAL ADEQUACY OF INDIANA JOINT SCHOOL ORGANIZATIONS

(Publication No. 13,218)

Edward Elmer Glenn, Ed.D.  
Indiana University, 1955

The problem. Indiana school administrative units have had many revisions. Congressional townships were once divided into school districts, but, township, town, and city school corporations have been school administrative units since 1852. This study concerns one of the two types of Indiana reorganized school units - joint school organizations.

Because many Indiana educators felt there were inadequacies in several joint school organizations it was decided to study the administrative and educational adequacy of joint school organizations in Indiana in 1953-1954. If any of the joint school organizations were found to be of inadequate size, an attempt was made to determine whether territories should be added to make them adequate. If it were found that territories should be added, an attempt was made to determine whether the proposed reorganized school unit would be able to finance a satisfactory educational program. Also an attempt was made to determine what the state needs to do to help make further desirable school reorganization financially advantageous.

Research procedure. The data for this study of joint school organizations were obtained from official reports in various state offices, from analysis of legal documents, and from the superintendents of the joint school organizations.

The procedures used were (1) to develop tentative criteria, (2) to establish criteria for school unit reorganization in Indiana with the assistance of a "jury of experts," (3) to interview the administrator in each of the joint school organizations in Indiana, and (4) to judge the adequacy of the joint school organizations according to criteria developed for this study.

Findings and conclusions. The findings and conclusions of this study were: Approximately 80 per cent of the joint school organizations operating schools in Indiana in 1953-1954 were formed by 1930. This fact and the fact that only two joint school laws had been enacted between 1935 and the date of this study indicate very little public interest in establishing joint school organizations. Approximately 95 per cent of the existing joint school organizations did not have

the accepted minimum enrollment of 1,200 pupils. As might be expected, a large number of these small joint school organizations had inadequate programs and services, and only 55 per cent of them met the criterion of operating schools for grades 1 through 12. Many of the organizations were not operating their schools according to the provisions of the law permitting their reorganization.

In several respects the financing of joint schools in Indiana is unique. The participating school corporations furnish the funds for operating the joint schools. In only five of the joint school organizations were the school tax rates of participating school corporations equal. Usually assets and liabilities are considered as belonging to the member school corporations of joint school organizations even after reorganization. The method of distributing state school funds in Indiana was not found to be a factor retarding the formation of joint schools. On the other hand, Indiana policies and laws concerning state distribution of school funds have not encouraged school unit reorganization.

It is advisable that school officials exercise considerable leadership in effecting the logical reorganization of school units; otherwise some small and possibly poor areas will find themselves alone and unable to provide an adequate educational program at a reasonable cost, while others may merge in order to enjoy a preferred financial status.

The per pupil expenditure in the large joint school organizations was approximately equal to the expenditure in the small organizations, but the educational programs and services were considerably greater in the larger organizations.

267 pages. \$3.34. MicA 55-2034

#### COOPERATIVE DEGREE PROGRAMS IN AMERICAN COLLEGES AND UNIVERSITIES

(Publication No. 12,950)

Robert Irwin Hudson, Ed.D.  
Michigan State University, 1955

The object of this study was to survey cooperative work-study programs in American colleges. Information on enrollments, operating practices and problems, future plans, and the names of representative employers were obtained through questionnaires sent to 87 colleges believed to have cooperative programs. Seventy replies were received. Of these 17 had no programs. The analysis of college practices was based upon usable questionnaires furnished by 46 colleges. In computing total enrollment figures, data from another study made at the same time were added. Other questionnaires were sent to 125 employers listed by the colleges. Sixty-eight, or 53% of the total, furnished usable replies. They had an average of 12.6 years of experience with cooperative students.

#### Findings

Programs were found to exist in 56 colleges, with a total cooperative enrollment of 18,634 students in the Fall Term, 1953. Two-thirds of these were in some type of Engineering. Approximately 62% of the Engineering students were enrolled in colleges where only cooperative

curricula were offered. Most non-Engineering students were enrolled in Liberal Arts, Business Administration, or Retailing. The colleges were divided into three groups: Engineering, non-Engineering, and Mixed, the last-named having both types of students. The seven Mixed colleges included 11,739 students, nearly two-thirds of the total enrollment.

Most Engineering and Mixed colleges schedule alternate periods of full time work and study, and require at least five years for completion. Non-Engineering programs are frequently operated on a part-time basis. Coordinators in the Engineering and Mixed groups tend to devote most of their time to the cooperative program, while those in the other colleges spend much time in teaching. Most non-Engineering students are placed locally, while the other groups usually place a majority of students within a fifty mile radius. Student earnings range from 60% to 83% of college costs. Employers prefer to have students spend all of their work periods in one organization, and plan sequences of experiences for them. Nearly all colleges require periodic reports from employers and students. Very few employers pay any part of the cost of coordination or furnish scholarship aid.

Employers rated cooperative students as superior to regular workers on four basic characteristics. More than 90% indicated a preference for hiring cooperative graduates because they can be placed immediately on productive assignments. The principal benefits of the cooperative system for students are vocational guidance, supplementary training in the major field, financial aid, personal development, and job placement. Colleges gain through better relations with industry, increased student motivation, financial savings, curriculum development, and increased stability of enrollment. Employers benefit through improved selection and reduced training costs. Present problems of cooperative colleges and employers are mainly related to a shortage of students. Employers suggested improved counseling and guidance, and better publicity. Most colleges reported that they could place more students, and two-thirds of the employers plan to hire more students. More than 80% of the employers felt that they would benefit from an increase in the number of cooperative colleges.

#### Conclusions

Ample opportunities exist for the expansion of the cooperative system in colleges. Each institution can accommodate a larger number of students through the alternating schedule. Greater efforts to interest students in the cooperative plan are necessary. Increased employer financial aid for present and future programs is necessary. A proposal for such aid is presented.

145 pages. \$1.81. MicA 55-2035

#### A STUDY OF SELECTED ASPECTS OF ORAL AND WRITTEN COMMUNICATION AS THESE ARE A PART OF SCHOOL PUBLIC RELATIONS PROGRAMS

(Publication No. 12,953)

Edward Pfau, Ed.D.  
Michigan State University, 1955

This study was concerned with ways public school officials can communicate more effectively with lay citizens. Aspects selected for study included: 1) successful communication principles; 2) research findings pertinent to communication; and 3) a critical analysis of school public relations procedures.

The major emphasis of the study was on means or media, and agents used. Pertinent communications research was reviewed for the purpose of selecting basic principles of communication. The standards developed were applied to public school settings.

#### Conclusions

1. School public relations procedures are basically concerned with the transfer of meaning between two or more people, organized in some form of a spatial and social relationship, using some kind of a medium and using written or spoken language.
2. Pertinent factors limiting and structuring the act and effectiveness of communication are: a) the originator; b) the receiver; and c) the medium used.
3. The frequency and intensity of exposure to information materials is not an index of effectiveness.
4. Information items from mass media are selected for perception on the basis of audience expectations. Methods for increasing the reward expected and a reduction of the effort required for perception were identified.
5. Information efforts designed to reach all groups requires diversified materials, since adults read on different levels.
6. Current mass information efforts for school public relations purposes tend to reach those already "friendly" or interested but fail to reach groups not interested, unfriendly or whose expectations have been violated.
7. The relatively standardized, specific information media in current school use adapt readily to production requirements for a heterogeneous audience and may become a most effective contribution to the information effort when the needed audience research is performed.
8. The most effective means for reaching groups or individuals are those involving face-to-face discourse. A promising but little known procedure consists of the identification and utilization of "opinion leaders" for school public relations purposes. The organization of groups for school public relations efforts at communication supplements the mass and specific media now available.

#### Recommendations

1. Audience and content analysis research is needed to determine the effectiveness of recommended procedures in school public relations efforts.
2. Identification of the groups which current efforts at communication are not reaching should be undertaken.
3. The development of easily administered, valid means



for identification of the state of information, opinion, and attitudes possessed by the adult members of a local community is needed.

4. The moral implications of the use of "tricks" for attention getting, manipulative techniques, and the arousal of emotions in school public relations programs need to be explored.

5. The development of easily used means for the identification of the "opinion leaders" in a community and methods for incorporating these persons into the current schemes for organizing groups for school public relations purposes is needed.

6. The relationship between knowledge of and attitudes toward the public school is in need of further exploration. Tentative information now available indicates that the belief that friendly attitudes toward the school increase as the extent of knowledge increases may not be valid.

385 pages. \$4.81. MicA 55-2036

#### AN ANALYSIS OF CURRENT PRACTICES IN EVENING TRADE EXTENSION CLASSES IN THE LARGEST TEN CITIES IN EACH OF FIVE MIDWESTERN STATES

(Publication No. 13,224)

Dennis Henry Price, Ed.D.  
Indiana University, 1955

The purpose of this study was to investigate the current practices in the evening trade extension program. This is a part of the larger programs of trade and industrial education which, in turn, make up one of the services available to the public under the general classification of vocational education.

The problem was concerned with the manner in which the evening trade extension classes originated as well as a review of the framework, local, state and federal, under which they function; the nature of the course content, the financial basis of the program, and the certification and qualification of instructors; methods of recruitment of instructors, teaching load, and upgrading practices; and instructional materials, their sources, and the manner in which they were utilized. The study, however, was limited to these courses that were given under the auspices of the Smith-Hughes and George-Barden acts.

Procedures included the selection of trade extension programs from 10 cities in each of five midwestern states. An interview schedule sheet was developed to guide the inquiry with the personnel in each of the 50 cities. This guide sheet was divided, for convenience of interviewing, into two parts. The material presented by each of the five state supervisors was supplemented by data obtained from the local vocational administrators. Information recorded on the interview guide sheets was collected on master sheets. From those master sheets the data were analysed and organized into tables.

The study revealed that 16 cities in the five state area, each larger than the tenth city included in the study for each state, offered no trade extension training. The multiplicity of titles held by the vocational administrators of the

50 cities indicated varied responsibilities to vocational and other forms of education. Few vocational administrators held titles specifically identifying them with trade extension programs.

The wide diversity of promotional devices did not indicate any effective patterns of promotion that could be pointed out as potentially useful in trade extension programs. Teacher certification in the five states depended on securing the approval of the local administrator and meeting minimum standards for trade experience. The certification practices, therefore, assured only minimum competency.

Instructor training was generally considered to be a local responsibility. Instructors were more frequently selected from the ranks of the skilled trades than from the ranks of the day trade instruction staff. Little use was made of advisory committees.

The wide diversity of course titles and the seeming overlap of many titles point to the lack of standardization of offerings and possibly of content in similar occupations.

Checking attendance, wherever it occurred, followed such haphazard methods that the practice of granting certificates or letters of attendance seemed to be of little concern to school personnel responsible for trade extension administration and supervision.

The order of use of the various teaching techniques seemed to indicate a tendency to utilize those techniques requiring a minimum of preparation on the part of the instructor.

The methods of financing local programs varied more in the range of fees collected than in the amounts of reimbursement from state and federal funds. Salaries, however, reflected local influences of policies with respect to pay rates and bore no consistent relationship to state reimbursement rates.

Recommendations include, (1) local surveys should be initiated to determine training needs; (2) expanded utilization of vocational advisory committees; (3) adequate financial support for trade extension programs; (4) standardization of course content; and (5) increased teacher supervision. 228 pages. \$2.85. MicA 55-2037

#### AN ANALYSIS OF EXPERIENCES RECOMMENDED FOR AN ADMINISTRATIVE INTERNSHIP

(Publication No. 13,229)

John Henry Schnabel, Ed.D.  
Indiana University, 1955

This study was undertaken to determine what experiences would be recommended for an administrative internship program by school administrators who expressed the opinion that internships should be an essential part of the training program for educational administrators; to make an analysis of those experiences to determine whether they warrant inclusion in the curriculum of an internship or should be a part of course work laboratory experiences; and to formulate specific conclusions and recommendations relative to acceptable internship experiences in the professional preparation of educational administrators.

A questionnaire was sent to 105 selected Indiana school

administrators including superintendents, high school and elementary principals. Personal interviews were also made by the investigator as a means of verifying the answers. The data were then analyzed in view of the implications of the critical experience description in the questionnaire and recommendations of the administrators in personal interview.

Three hundred and twelve recommendations were made in 31 experience areas which divided themselves into groups of responsibilities related primarily to educational services, business management, and public relations. The experiences recommended for the educational services division included scheduling, managing the office, administering the guidance and counseling program, developing and evaluating the curriculum, organizing the activities program, managing the cafeteria, reporting, controlling athletics, administering the testing and evaluation program, administering the library, developing the visual aids program, and administering the home-room program. Included in the experiences recommended for the business management division were preparing and presenting the budget, supervising plant maintenance, financing special activities, obtaining new buildings, general financing of the educational program, purchasing procedures, handling of school funds, interpreting legal aspects, administering the bookstore, planning of salary schedules, and obtaining federal aid. The public relations division was divided into internal and external relationships. The internal group included experiences in personnel relationships, supervision and improvement of instruction, student relationships, administration of in-service training and administration of non-teaching personnel. Experiences in the external group were community relationships, board of education relationships, and utilization of mass media of communication. Twelve experiences selected on the basis of the short-time element and limited number of personal relationships involved were considered as possible laboratory or laboratory-internship experiences. The remaining recommended experiences warranted inclusion in an administrative internship by virtue of greater length of time, greater number of personal relationships, intangibles, and administrative decisions involved in their planning.

Among the conclusions drawn from the findings were the following:

1. Administrators consider one of the most important aspects of their job to be that of working with people.
2. Administrators need experiences which provide opportunity for the development of insights and techniques in working with people.
3. The prime factor in the recommended experiences was the emphasis on human relationships.
4. To be of most value, experiences must arise from real situations.
5. The area in which training institutions need to extend their services in laboratory experiences is the human relations area.
6. The placement of the recommended experiences in laboratory or internship programs is dependent upon the extensiveness and intensiveness of the institution's training program.

It was recommended that:

1. An extended laboratory experience program be provided in connection with course work and that it include certain experiences recommended in the study.
2. An administrative internship be provided for persons

who have not developed competencies in the recommended experience areas; each internship to be planned cooperatively with the future administrator to fit his particular needs.

3. Institutions evaluate their programs for the training of school administrators with a view to placing a deliberate emphasis and steady focus on the area of human relations in the curriculum. 94 pages. \$1.19. MicA 55-2038

#### A STUDY OF SCHOOL DISTRICT REORGANIZATION IN MICHIGAN

(Publication No. 12,959)

Roland Samuel Strolle, Ed.D.  
Michigan State University, 1955

It was the purpose of this dissertation to inquire into the existing pattern of school district organization in Michigan and to measure this pattern of organization against recognized criteria for adequate administrative units. An analysis of the reorganization programs of selected states, verified by the literature in the field, identified four basic characteristics of an adequate school district. These characteristics are:

1. A complete program of education from kindergarten through grade twelve.
2. A minimum enrollment of 900 in grades K-12.
3. A minimum valuation of \$6,000,000 or a per-pupil valuation of \$7,000.
4. Evidence of community interest or social cohesiveness.

Special emphasis was given to the application of these criteria to the rural areas of Michigan.

#### Summary

On the basis of the criteria selected, only 153 school districts met the requirements of adequacy as far as program, enrollment, and valuation were concerned. For example: 3,976 of the 4,510 school districts did not maintain a complete educational program through grade twelve, thus leaving 534 that met criterion one; 349 of the 534 districts had fewer than 900 pupils enrolled, thus leaving 185 that met both criteria one and two; 381 of the 534 districts had fewer than 900 enrolled and a valuation of less than \$6,000,000 thus leaving 153 administrative units that met criteria one, two, and three.

#### Conclusions

This study concluded that Michigan's pattern of school district organization is inadequate for the following reasons:

1. The voters in more than eighty-five percent of the school districts are disfranchised either partially or wholly as far as educational matters are concerned.
2. Fourteen percent of the total property valuation of the state does not bear its just share of the cost of public education.



3. The future secondary education of more than 68,000 students (non-residents) is in jeopardy.
4. Many of the present school districts do not have sufficient financial resources.
5. The enrollments in many of the districts are so limited that it is difficult to provide an adequate, flexible educational program.

#### Recommendations

The improvement of Michigan's organization of school administrative units should include the elimination of all closed districts, the consolidation of all districts which do not provide a complete program, kindergarten through twelve, with their high school centers, and the elimination of all special act charters.

Specific recommendations are:

1. Strengthen the Area Study Act to make county-wide reorganization studies mandatory.
  2. Establish a State Commission on School District Reorganization.
  3. Conduct further research to establish criteria for satisfactory administrative units in Michigan.
  4. Recodify and simplify legislation relating to reorganization.
  5. Revise the state aid formula to remove existing financial barriers to reorganization.
  6. Establish a program of financial assistance for capital outlay in newly reorganized districts where the need has been established.
  7. Encourage research on such problems as:
    - a. the role of the intermediate district in providing needed educational services to areas of sparse population,
    - b. ways and means of enriching the program of the open-country high school, and
    - c. the role of the community college as it relates to the organization of adequate school districts.
- 255 pages. \$3.19. MicA 55-2039

#### A STUDY OF THE RELATIONSHIP BETWEEN PROGRAM DEVELOPMENT AND THE WORKING PATTERNS OF SCHOOL PRINCIPALS

(Publication No. 12,785)

Woodrow Bullock Sugg, Ed.D.  
The University of Florida, 1955

This investigation was developed within the matrix of the University of Florida Leadership Study, which was a part of the nation-wide Cooperative Program in Educational Administration. The purpose of the University of Florida Leadership Study was to investigate the working patterns of public school principals and to study the relationships between these ways of working and pupil achievement, human relationships, program development, school-community relationships, teacher attitudes, and teacher activities.

The classifications of working patterns of principals and techniques for collecting program development data were determined by previous studies which were a part of the over-all design of the University of Florida Leadership Study.

The purpose of this study was to investigate the relationship between program development and the working patterns of school principals in a selected school system. Principals who participated in this study were described as being relatively democratic or relatively authoritarian in their leadership patterns of operation.

Ten elementary and five secondary schools with principals classified as authoritarian and ten elementary and five secondary schools with principals classified as democratic were compared as to the readiness of teachers for curriculum change, the amount and kinds of changes made in school programs, and as to the methods used to produce change.

Three hundred and ninety-four teachers completed the Curriculum Improvement Measure developed by Duncan to measure readiness of teachers for curriculum change. Data gathered from the principal and five selected teachers in each of the thirty schools studied, were used to compare the authoritarian and democratic groups of schools in the amount and kinds of program changes made and methods used to produce these changes. These data were collected by the use of Thompson's Program Development Interview Guide and interviews.

The following conclusions were reached:

1. Readiness of teachers for curriculum change is related to the ways of working of principals on the elementary level of schools. Teachers in democratic elementary schools were more ready for curriculum change than teachers in authoritarian elementary schools.

No significant relationship was found between the working patterns of principals and the readiness of teachers for curriculum change in secondary schools.

2. There is a difference in the amount and kind of program change in schools with the two types of principals. When courses were classified by subject fields, more extensive modifications were made in the democratic schools than in the comparable group of authoritarian schools. The democratic schools made more changes in daily schedules, guidance services and procedures, and other services than were made by the authoritarian schools. The programs of democratic schools were expanded more extensively in these areas than were evidenced in the authoritarian schools. The democratic and authoritarian schools differed significantly in all of these changes.

Though the democratic schools added more courses and subjects and dropped fewer courses and subjects than the authoritarian schools, the two groups of schools did not differ significantly.

3. There was evidence of a relationship between methods used to produce program change and the operating patterns of principals. In contrast with the authoritarian schools the democratic schools made more use of non-staff persons in program change; the democratic schools utilized a greater number and more varied procedures in making program changes; and the faculties of the democratic schools used a greater variety of work groups and meetings in program development.

The findings and conclusions presented above indicate that there is a relationship between the development of school programs and the working patterns of principals.

183 pages. \$2.29. MicA 55-2040

# COMMUNITY ACTIVITIES OF ELEMENTARY SCHOOL PRINCIPALS OF NEW JERSEY

(Publication No. 12,875)

Granville Souder Thomas, Ed.D.  
Temple University, 1955

The purpose of this study was to discover and describe the extent and nature of the community activities of the public elementary school principal in the state of New Jersey. The data for this study were secured from a questionnaire answered by 677 principals, 51.4 per cent of those polled.

The elementary school principal was an active member of community organizations. The time spent on community activities usually was outside the regular school day. The Parent-Teacher Association, church groups and service organizations dominated the groups supported by the principals. National youth movements such as Scouting were supported by the principals.

The principals used non-school agencies, governmental and non-governmental, readily at hand. Excursions, community units, resources, and community personnel were used by the majority of the principals. Most of the principals reported some sort of community survey.

Children engaged in community projects such as improving the physical environment, raising money for charity, Christmas and Thanksgiving baskets, and personal services for community agencies.

Public relations media were used extensively by the majority of the principals. However, reports indicated that in the majority of cases, no continuous, planned program of public relations existed.

The principals reported that coordination of youth activities was usually without the help of the community council or central planning agency. Community youth planning was done directly by school and interested groups.

The majority of the principals encouraged the use of school facilities by outside groups. Most of the schools were open at night for community use. The median number of nights per week schools were open was two. Three organizations per week used the average school building. Generally a nominal fee was charged.

Pre-service training for community activities was received incidentally. Extra-curricular activities and incidental training were dominant methods of training reports. In-service training was received through faculty meetings, graduate school, conferences and workshops, in that order. Courses in administration and supervision and community activity courses were reported as most helpful. The single courses most reported were community and public relations and administration.

The majority of the principals reported encouragement by the administration and board of education in conducting community activities. Nearly all of the principals reported need for help in planning community activities programs.

Accepted techniques, media and devices common to school literature were employed by the principals.

The function of the principal in community-wide planning seemed to be in need of better definition and direction.

Further study of the field of community activities, particularly in the area of community-wide planning, seemed to be indicated.

152 pages. \$1.90. MicA 55-2041

# A STUDY OF STUDENT DISCIPLINARY PROGRAMS IN TEN SELECTED UNIVERSITIES

(Publication No. 12,962)

John Willard Truitt, Ed.D.  
Michigan State University, 1955

The problem. The purpose of this investigation was: (1) to study the organization, administration, and operation of student disciplinary programs in ten selected universities; (2) to compare these programs; (3) to determine those disciplinary procedures that appeared to be educationally sound and functionally effective; and (4) to recommend those procedures that appeared to be worthwhile and desirable.

Method, technique, and data. The normative survey method was employed since it utilizes research techniques most appropriate for this study. The specific methodology employed was a combination of: interview, interview outline, direct observation, and printed materials obtained from the universities.

An interview outline was prepared to provide consistency to and standardization of material collected at the institutions studied. Because of the complexity of this area of the student personnel program, personal visitations and structured interviews with administrators, faculty members, and student leaders were necessary to complete the investigation.

Findings and conclusions. On the basis of interview, observation and analysis, the following findings and conclusions are presented:

(1) Student disciplinary programs seem to function better at those universities where the original delegation of authority is clearly defined.

(2) Orientation and communications are two extremely important areas of the student disciplinary program. Due to the sharp increase in student enrollment which adds to the complexity of the college community, the disciplinary officials agreed that much more attention should be directed toward the development of these two closely related areas of the student disciplinary program.

The disciplinary officials are further agreed that the system of student records is another aspect of the disciplinary program that should be given greater attention by personnel administrators.

(3) The student personnel structure varies from university to university, thus causing considerable difference in the basic patterns of administrative organization. It was the consensus of the university officials contacted that these variations of structural patterns are wholesome if the disciplinary programs fulfill the functions for which they were created.

(4) There is a trend toward the selection of disciplinary officials who possess similar experience and training required in other student personnel positions.

(5) By virtue of his enrollment, the student enters into a moral agreement with the university that he will obey the rules and regulations and will observe the standards expected of students by the university. The disciplinary officials are agreed that this is a two-way agreement and that the obligations of the agreement are binding on both the student and the university. They further agree that when the student violates his part of the agreement the university officials have the responsibility of taking the



initiative in bringing this student-university agreement back within acceptable limits.

The data of this study indicated a lack of understanding and awareness on the part of the students and university officials regarding the full significance of this moral agreement. The obligations of this agreement are the bases of many of the policies and procedures employed by university officials in an effort to regulate the conduct of the student.

(6) Great similarity was found among the disciplinary actions employed by the universities in their efforts to regulate student conduct.

(7) Very little formal follow-up of students who have created disciplinary situations is being conducted at the ten selected universities.

(8) A summary of the rating of student offenses indicated that the disciplinary officials are in major agreement on the following categories: poor citizenship, disorderly conduct, minor misconduct, financial irregularities, theft and burglary, and infractions of social rules. Considerable more variance was indicated in the categories of: illegal use of alcohol, illegal use of cars, explosives, fires, false identification, and destruction of property.

(9) It was the opinion of the officials interviewed that an annual workshop employing the case study method would be desirable to develop a disciplinary handbook for the ten universities and to exchange basic research concerning behavior problems.

(10) The study indicates that it is highly desirable for members of the faculty, administrators, and students to participate jointly in the operation of the student disciplinary programs.

(11) No specific academic area or type of training as a requisite for competent personnel workers in the disciplinary program was agreed on by the personnel and disciplinary officials.

(12) The personnel administrators revealed that the over-all function of the disciplinary program should be preventive and remedial in nature.

201 pages. \$2.51. MicA 55-2042

**TECHNIQUES USED FOR PREDICTING  
PUBLIC SCHOOL ENROLLMENTS IN  
DETROIT, MICHIGAN, USING THE  
ELEMENTARY SCHOOL SERVICE  
AREA AS A BASE FOR ALL UNITS**

(Publication No. 13,207)

Norman S. Wheeler, Ed.D.  
Wayne University, 1955

A board of education in any school system faces many budgetary demands. Demands for school buildings receive top priority. It is the premise of this study that reaching decisions to meet building needs should not be determined on expediency or pressure techniques but upon the best scientific solution to the problem. The techniques developed to help the Detroit Board of Education make the best possible decisions in the expenditure of money for school buildings are presented in this dissertation.

The elementary school service area, the area from which children may attend a given elementary school, is

established in this dissertation as a base unit for estimating future public school enrollments. The elementary school service area has the advantage of flexibility in that it can be utilized to determine secondary school building needs as well as elementary. Using the elementary school service area as a base has indicated where and when in Detroit the need for public school buildings will be most urgent.

In determining the size of new school units and additions to existing buildings, a board of education must use recommendations based on long-term enrollment estimates that go beyond "peak" years of enrollment. Such estimates are dependent upon knowing the number of babies that will be born in a given area. It is felt that much of the strength of the prediction procedures described in this paper lies in the birth prediction procedures which have been developed. The dissertation shows that it was unnecessary to develop different birth prediction procedures for each of the 201 elementary school service areas in Detroit, but rather that four prediction patterns emerged.

The "standard procedure" is applicable where homes are being built and occupied at an average rate.

The "ratio method" may be used where homes are being erected very rapidly and large numbers of younger families move into the area simultaneously.

The "interpolation method" may be applied where a limited amount of rapid home building may be done, but where the rate of building and occupancy may dwindle off to a point where the standard procedure will apply.

The "birth trend procedure" is used where practically no home building can be done and where homes are occupied by new families when older families give them up.

The number of estimated births, year by year, for a given service area, and the age distribution for the latest census year permit the determination of future age distributions.

From the age distributions for future years, the school population for the service area is predicted by applying an appropriate age-to-grade per cent. This per cent is a variable which takes into consideration the type of non-public school influence which exists in the service area.

School housing problems are created for any board of education in a large city by the clearance of slum areas and their redevelopment into low-rent public housing units which concentrate a large population in a relatively small area. The use of the tenant leases as a source for basic data, the development of special survival ratios, and the recommendations made for solving current and future school housing problems are described in this dissertation.

Confidence has been expressed by the executive staff of the Detroit Board of Education in the techniques presented in this dissertation. Decisions based on these techniques affect the location of sites and the erection of the school buildings in Detroit's multi-million dollar school building program. The writer believes that the techniques described in this dissertation are applicable to problems faced by other school systems.

128 pages. \$1.60. MicA 55-2043

# A STUDY OF THE RELATIONSHIP BETWEEN PUPIL ACHIEVEMENT AND THE WORKING PATTERNS OF SCHOOL PRINCIPALS

(Publication No. 12,787)

John Bruce Wilson, Ed.D.  
The University of Florida, 1955

This study is a part of the W. K. Kellogg Foundation-University of Florida Leadership Project of the Southern States Cooperative Program in Educational Administration. It is an investigation of the relationship between the operating pattern of the school principal and achievement of pupils in selected content fields. Specifically, it is designed to answer this question: Is relatively democratic or relatively authoritarian behavior of the public school principal related to the achievement of pupils in grade six in reading, English, and arithmetic, when differences in socio-economic status of pupil's parent, sex of pupil, chronological age of pupil, number of years the pupil has been enrolled in the same school, and mental ability of the pupil are taken into account?

The study is divided into three phases; namely, (1) selection of schools and collection of data, (2) analyzing the data, and (3) determining the relationship of the principal's working pattern upon the achievement of students in reading, English, and arithmetic.

Fifteen elementary schools were selected in Hillsborough County, Florida. Eight of these schools were supervised by relatively democratic principals; seven were supervised by relatively authoritarian principals. The classification of these principals was determined by their responses to the Principal Behavior Check List. This checklist was developed by Morton Alpren during phase 1 of the Florida-Kellogg Leadership Project. The data were collected by administering the California Achievement Test, Elementary Battery, Form BB, (1950 edition); the California Short-Form Test of Mental Maturity, (1950 edition); and by asking the students their age, sex, the number of years they had been in the same school, and their parent's occupation. The data were collected from 1,204 students enrolled in 39 sixth-grade sections of the fifteen selected elementary schools.

In analyzing the data it was found that the number of years the student had been enrolled in the same school and the socio-economic variables proved to be unimportant sources of variations in student achievement. When the mental maturity variable was controlled, the results indicated that the sex of the student and the section in which the student was a member influenced his achievement in arithmetic, English, and reading. The results also indicated that the arithmetic, English, and reading achievement of students enrolled in schools supervised by democratic principals was not significantly different from the arithmetic, English, and reading achievement of students enrolled in schools supervised by authoritarian principals. That is, students did not experience an advantage in arithmetic, English, and reading by being enrolled in schools supervised by democratic principals. The reverse of this is true also. That is, students did not experience a disadvantage in arithmetic, English, and reading by being enrolled in schools supervised by democratic principals.

The evidence indicating that students experience an advantage in arithmetic, English, and reading by being enrolled in certain sections and by being a particular sex in

certain sections suggests that studies to determine the relationship between the operating pattern of the teacher and the achievement of the student and the operating pattern of the teacher and the achievement of the student of a particular sex might prove rewarding. Studies appear to be needed that are designed to determine the relationship between the principal's operating pattern and student achievement in certain content fields when the students are exceptionally high or low in mental ability.

Since this study included only students of a certain age group, it appears that other age groups should be studied. That is, studies to determine the relationship between the operating pattern of the school's status leader and achievement of pupils at the junior high, senior high, and junior college levels might be conducted. These studies could be limited to include only the academic subjects or could be expanded to include other variables such as student participation in organized clubs, student adjustment, or student personality. 80 pages. \$1.00. MicA 55-2044

## STATE SCHOOL PLANT STANDARDS AND REQUIREMENTS

(Publication No. 13,237)

William Owen Wilson, Ed.D.  
Indiana University, 1955

Supervisor: Paul W. Seagers

As a result of pupils being housed in extremely unsatisfactory surroundings and in severely overcrowded school houses, the American people have awakened to the need for both rapid and extensive school construction. Due to the emphasis on school building construction, more attention is being paid to the existence and use of standards and codes than ever before.

The purpose of this study is to compare state codes and guides by geographical regions. The data for the study were obtained from legislative enactments and laws, codes, guides, specifications, rules and regulations of the various State agencies of the several states. An analysis of the data was made and is presented in a brief state by state resume of the various controls and regulations. A tabular comparison is made in certain fields between the states located in certain geographical regions. For the purpose of comparison, the United States was divided into six regions. The nine fields compared are general approval of plans, sites, general construction of buildings, space requirements, lighting and electrical, heating and ventilating, plumbing and toilet fixtures, fire safety equipment, and halls, corridors and stairways.

In summarizing, certain facts seem to be evident. Most states require that the preliminary and final plans for the building be approved by the chief state school officer. Some standards are required, while others are recommended or suggested. Sixteen states have no school building codes. One of the greatest concerns of the states is that of fire safety and they have numerous regulations and controls concerning this subject. Most states have recommendations as to the number of toilet fixtures needed in each school and as to the light intensity required in the rooms housing various activities.



In general, the northwestern and southwestern states have the fewest controls while the northeastern states have the most. Over one-half the states have some type of regulatory control over all areas except general construction and sites.

There seems to be a tendency among many of the states to veer away from rigid and extensive codes toward suggestive guides and standards. Flexibility and adaptability to local needs seems to be desirable and these are difficult to obtain if the state attempts to exercise too many controls.

Building codes reflect the growing knowledge of health and safety and the relative concern of the various communities for the physical arrangement of their school buildings. Since education is a State function, it seems justifiable that the states should assume responsibility for the construction of school houses. It appears, therefore, that the states should adopt standards and regulations which shall insure safe and satisfactory buildings and which at the same time are flexible and adaptable enough to permit local conditions to be satisfied.

328 pages. \$4.10 MicA 55-2045

#### AN ANALYSIS OF THE GUIDANCE ORGANIZATION AND SERVICES IN SELECTED JUNIOR HIGH SCHOOLS IN THE STATE OF OHIO

(Publication No. 13,238)

Maurice Aaron Wogaman, Ed.D.  
Indiana University, 1955

The purpose of this study was to analyze and appraise the guidance organization and services of 18 selected junior high schools in Ohio. Specific purposes of the study were: (1) to analyze organizational patterns of guidance in the individual schools; (2) to determine the various guidance services provided; (3) to determine present problems and recent and anticipated changes in the organizational patterns for guidance; (4) to determine the methods used in appraising the guidance program in these schools, the acceptance of certain basic principles of guidance, and the degree of attainment of these principles; and (5) to derive conclusions as warranted by the findings which will serve as a basis for the improvement of guidance in these 18 selected junior high schools.

The 18 junior high schools selected for participation in this study were from 18 separate city school systems. All schools had an enrollment between 540 and 1,043, the median being 665.

Data for this study were collected by means of personal interviews. Interview guides for directors of guidance, teachers, and pupils, and a list of basic principles of junior high school guidance were the instruments used to obtain most of the data. The major part of the information was obtained through an interview with the individual who directed the guidance program. To validate the data reported by the directors of guidance, three teachers and 12 pupils in each of 17 of the 18 schools were interviewed. Also, the pupil cumulative records and daily schedule of classes were studied. In the development of conclusions, findings were compared to recommended practices in a publication by the Committee on Junior High School Pro-

blems of the California Association of Secondary School Administrators, *Organizing the Junior High School*, and from Ohio High School Standards: Administration, 1953, put out by the Department of Education, State of Ohio.

Data obtained from the studies in each school were presented under the following headings: (1) personnel in relation to guidance; (2) organizational patterns for guidance; (3) specific guidance services; and (4) guidance changes, problems, appraisal, and principles.

Eighteen conclusions concerning the guidance organization and services in the 18 selected junior high schools in Ohio were made. Some of the more important of these were:

1. Guidance is a major function of the school program.
  2. Guidance organizations and services are being extended and increased.
  3. Additional guidance personnel and additional time for guidance personnel are needed in the individual schools.
  4. In general, guidance is being administered through recommended practices.
  5. Among the specific group guidance services which approached satisfactory levels were educational planning, knowledge of school offerings, orientation for incoming students, exploratory courses, courtesy and social behavior, community citizenship, and physical health.
  6. In general, individual pupil guidance services were inadequate.
  7. Pupil information collected as a part of the guidance program was not adequate.
  8. The major problems in guidance were the need for more time for guidance personnel, more clerical help for guidance personnel, more time for teachers to do guidance work, more trained guidance personnel, and more financial aid for guidance programs.
  9. Little has been done toward the appraisal of the guidance programs in the individual schools.
- On the basis of the findings and conclusions of this study, one general conclusion can be drawn:  
Considering the guidance personnel and the guidance facilities available at the present time in the junior high schools participating in this study, these schools are providing a reasonably adequate guidance program.

340 pages. \$4.25 MicA 55-2046

#### EDUCATION, ADULT

##### ADMINISTERING UNIVERSITY NON-CREDIT PROGRAMS FOR BUSINESS GROUPS

(Publication No. 12,763)

Frank Thompson Adams, Jr., Ed.D.  
The University of Florida, 1955

This is a study of the development of indices of merit and their application in self-studies of practices and procedures at member institutions of the National University Extension Association and the Association of University Evening Colleges. It is a study of patterns of planning, organizing, financing, and administering which Characterize

the direction of non-credit services through short courses, conferences, and institutes offered for leaders and their employees in business and industry by institutions affiliated in 1954-1955 with the NUEA and the AUEC.

The controlling objective has been the rendering of possible assistance to professional workers in the field of adult education by establishing more clearly defined criteria and guide-posts. Indices and procedural patterns were sought: (1) to guide university adult divisions in determining the nature and scope of non-credit programs for adults; (2) to indicate the responsibilities of university schools and colleges for extending their services to business groups through short courses, conferences, and institutes; (3) to guide university adult divisions in determining the type of personnel needed to plan and organize superior non-credit programs; (4) to serve as guides in determining non-credit program objectives which will aid university administrators in extending the educational limits of the university; (5) to guide the university in justifying the community areas to be served by the non-credit program; (6) to determine how such programs will be financed; and (7) to guide the university with the general problem of how to deal with the motives of adult business groups when requests are submitted for assistance.

Eleven distinct areas seemed to be important to the general administration of non-credit programs for business groups. They provide the framework, the guide-posts necessary in developing university programs and projects. The use of each of these eleven indices will make a significant contribution to most programs. This conclusion is reached as a result of the rating given each index, on a scale of inferior to superior, by respondents at seventy-nine institutions affiliated with the NUEA and the AUEC.

A rating of five or four, in accordance with the scale provided, indicated the respondent felt the index would make a significant or a highly significant contribution. Ten of the eleven indices were rated five or four in better than 80 per cent of the cases. One of the eleven indices received a percentage rating of five or four in 70 per cent of the replies. Comments made by respondents indicate that flexibility is a "must" of operation within the basic framework of the eleven indices, which are: Sponsorship, Programming, Financial Stability, Promotion, Cooperation, Program Coordination, Program Continuity, and Evaluation.

The instrument used for developing and checking procedural patterns was established within the framework of the eleven indices of merit. The survey form contains 269 items of procedure and practice and is of the open-end type allowing for clarifying comments. Each institution was asked to check all items describing applicable administrative procedure for non-credit programs.

Procedures vary with each project, depending upon the objectives of that project, wishes of the group being served, and university policy. The greatest need in the non-credit field is a sound administrative approach through careful planning, sound policy making, and practical program design. There has been no traditional or institutionalized guide-posts as in the academic program. Seventy per cent of the member institutions of the NUEA and the AUEC indicate each of the eleven indices as a basis of validity for educators using them as a framework of operation. It is felt that patterns of procedure derived from the survey form will serve as a basis for carefully planning

a custom built means of serving the educational needs and interests of the people who naturally look to the university for educational leadership.

246 pages. \$3.08. MicA 55-2047

## EDUCATION, GUIDANCE

### SOME FACTORS RELATED TO THE CHOICE-STATUS OF NINETY EIGHTH-GRADE CHILDREN IN A SCHOOL SOCIETY

(Publication No. 12,721)

Deborah Elkins, Ph.D.  
The University of Connecticut, 1955

**Statement of problem.** The purpose of this study was to examine several factors which appeared to be related to the choice-status of ninety children in an eighth grade of a school located in an urban community and to determine the extent of such relationship.

**Procedure.** Four sociograms for each of three classrooms were used for estimating choice-status; four sociometric interviews by each child in which he explained his reasons for choice of peers were analyzed for roles and behaviors related to choice-status; interviews with parents were analyzed for expressions of satisfaction or dissatisfaction with the child; four-day diaries kept by each child were examined for content of out-of-school activities related to choice-status; children's written responses to open-ended questions were studied for expressions of satisfaction or dissatisfaction by the child with the home situation; intelligence and achievement test results, measurements of height and weight, and chronological age were correlated with choice-status; and the index of status characteristics given in *Social Class in America* by Warner, Meeker, and Eells was used for ranking students according to socio-economic status.

**Results and conclusions.** The conclusions drawn from this study follow:

1. Some differences in behavior were found among the three choice-status levels. Highly chosen children were credited with being good-natured, helpful, comforting, protective, jolly, ego-supportive, and with having interests so varied that they could find some in common with several children. They were said to be accepting of others and to conform easily to group mores. Least-chosen children were often credited with behaviors unacceptable to the group or were so withdrawn that they were not noticed. Average-chosen children displayed behaviors similar to the most-chosen but to a lesser degree.

2. Most-chosen children displayed flexibility and variety in role-performance; least-chosen by contrast were rigid.

3. Most-chosen children engaged in a greater number of peer activities than did either of the other two groups. With the decline in choice-status there was a steady but not startling decline in number of peer activities mentioned.

4. Average-chosen children engaged in a greater



number of independent activities than did either of the other two groups. They mentioned more construction activities, more resting and eating alone, preparing of their own meals and buying their own clothes. They loafed less than the others and spent more time in remunerative jobs.

5. There was a very slight tendency for children whose parents expressed satisfaction with them to be also able to elicit this kind of response from peers as shown in choice-status. However, there were those in each of the three levels who belonged to satisfied as well as dissatisfied parents.

6. There was also a slight tendency for children who were younger than others and who came from families in comparatively more favored socio-economic circumstances to rank higher with peers. However, unacceptable behaviors were more important than the age-factor.

7. Intelligence and achievement showed wide differences between classrooms indicating the possibility that values were different where fewer children were socially mobile.

8. Non-promoted children were continuing to find difficulty establishing warm relationships with peers even though for several years they had been members of the same groups who were subjects of the present study.

9. There was no consistent correlation between physical growth and choice-status. Where the range was small there appeared to be fewer children who were having difficulty on this account. 351 pages. \$4.39. Mic 55-264

## EDUCATION, HISTORY

### THE CONTRIBUTIONS OF JOHN R. KIRK TO TEACHER-EDUCATION

(Publication No. 12,795)

Ferdinand Del Pizzo, Ph.D.  
Washington University, 1955

Chairman: Dr. Charles A. Lee

The study was undertaken (1) to develop and to explain those principles of teacher-education which John R. Kirk advocated; (2) to develop principles of teacher-education as disclosed in his writings, addresses, and official reports; (3) to point out those areas of teacher-education which were influenced by him; and finally, (4) to point out the direction of that influence.

The principal findings of the research reveal that President Kirk believed that in order to enrich the curriculum it should be broadened. As a consequence he introduced for the first time in Missouri the teaching of agriculture, commercial subjects, and manual training to prospective teachers.

Through the Kirksville Normal School Kirk stimulated a nation-wide interest in improving rural school education and rural life. While developing this program he emphasized three important aspects: (1) He erected a model rural school on the campus of the teachers college. this "model school" influenced the course of rural school

architecture for over forty years. (2) Dr. Kirk made arrangements for students to be transported to and from this school in a prairie schooner type wagon. This was the first attempt to transport students to and from school in Missouri and perhaps one of the first in the nation.

(3) To stimulate greater interest in rural education and rural life, the first department of Rural School Education as well as the first Rural Life Conference in Missouri was started at Kirksville, Missouri. Perhaps no other educator in America contributed as much to the improvement of rural school education and country life as did Dr. Kirk.

President Kirk's faith in a sound educational program for all teachers led him to advocate a program of teacher-education which required at least four years of broad educational preparation for elementary teachers as well as secondary teachers. Before his time more emphasis was placed upon the preparation of secondary school teachers.

In modernizing the educational program, John R. Kirk introduced many ideas which have become a part of the daily program of today's school. Such innovations as departmental libraries, music courses for credit, Bible courses as literature for credit, and the establishment of a Child Hygiene and Public Health Department were all introduced for the first time in Missouri by Dr. Kirk.

In addition to these contributions to teacher-education programs, he was a dominant figure in the struggle which the normal schools were having for national recognition. President Kirk played a major role in transforming normal schools to teachers colleges and in the founding of the American Association of Teachers Colleges. With the aid of several mid-western college presidents, he carried the fight for the recognition of teachers colleges all over the nation. Later this same group of educators became the charter members of the American Association of Teachers Colleges.

The general conclusions are: (1) John R. Kirk was convinced that some of the aims of education could be met only by change and experimentation; (2) the influence of President Kirk on rural education is perhaps unsurpassed by any other educator; (3) he was convinced that the public school was the most potent means of elevating the common man; (4) President Kirk believed that teaching was a profession and that it should be on a par with law and medicine; (5) he felt that the public schools were the only means of implementing the intrinsic ideals of American democracy; and (6) he was a man of wide vision whose contributions envisaged an ultimate ideal.

178 pages. \$2.23. MicA 55-2048

### THE RESPONSE OF THE PEOPLE TO THE USE OF FORMAL EDUCATION IN THE ATTEMPTED DENATIONALIZATION OF POLAND, 1795-1914

(Publication No. 12,597)

Anthony Louis Kar, Ph.D.  
University of Michigan, 1955

Most students of Polish education seem to agree that, for a period of about 120 years, Prussia, Russia, and Austria tried to denationalize the Poles by such means as the use of formal education. The powers tried

completely to eliminate the traditional patriotic fervor of the Poles. Although this policy seems to have had some effect on the Polish population, complete denationalization was prevented through the "self-protective" methods developed by the Poles. It is the purpose of this study to determine what the Poles did in opposition to the coercive educational practices of the three partitioning powers in the period between 1795 and 1914.

Since it is almost impossible to make such a study at this time in Poland, due to the existing international situation, primary and secondary source materials found in America have had to be used to solve the problem.

Fortunately, sufficient documentary source materials, biographies, memoirs, and reports of contemporary visitors to Poland for the purpose of the study are to be found in America. In addition, personal interviews with people who were educated in Poland during this period, as well as remembrances of the writer, have helped in analyzing the sources and comparing the collected data and guiding him in arriving at certain generalizations.

Events and problems relating to political and social fields not directly connected with education have been used for continuity, clarity, and chronology. It has not been the intention of this study to judge the wrongness or the rightness of the means employed by the foreign powers in Poland.

The results of the study confirm the belief that the partitioning powers used formal education for denationalizing purposes. The study further reveals that, although the partitioning powers did not use uniform measures to promote their denationalization policies, they did attempt in various ways to destroy the Polish language and the national feeling, and that "feeling of belonging" to one group in spite of political and geographical division. The Poles responded to their coercive measures with protective means to cause perpetuation of the Polish national spirit and to retain the native language. To the attempted foreign control of the schools, the nation responded with secret Polish schools. To government censorship of textbooks and the press, the nation reacted by producing its own press and literature which were not submitted to foreign censorship. Since the continued teaching of the Polish language depended on the majority of people living in a given neighborhood being Polish, the nation replied to the attempted colonization of Polish lands by organizing Polish loan and banking institutions for the retention of lands in Polish hands.

The effectiveness of Polish resistance is perhaps best shown by the fact that one of the powers, Austria, reversed its policy and adopted a more liberal program in education, while the other two powers made their programs of formal education increasingly more anti-Polish. Both moves can be interpreted as confessions of the failure in the use of restrictive measures in relation to schools.

While there is no definite evidence that the educational means of denationalization employed by each of the three partitioning powers made the Poles less Polish, there is evidence which points to the fact that the foreign rule had a uniting effect on the Poles, welding them into a cohesive group and destroying the provincial differences which, before and after the partitions, have tended to separate them.

207 pages. \$2.59. MicA 55-2049

## HIGHER EDUCATION IN THE FREE METHODIST CHURCH IN THE UNITED STATES: 1860-1954

(Publication No. 13,003)

Lawrence Russell Schoenhals, Ph.D.  
University of Washington, 1955

Supervisor: Curtis T. Williams

This study grew out of the realization that although the Free Methodist Church was soon to celebrate its centennial, no recent survey had been made of its accomplishments in the field of higher education. The investigation was pursued by means of personal visits to each of the colleges, by examination of published literature relating to the schools and to the denomination, and by questionnaires addressed to school officials and to selected graduates. Primary attention was given to those schools still in operation: Roberts Wesleyan College, Spring Arbor Junior College, Central College, Wessington Springs College, Seattle Pacific College, Greenville College, and Los Angeles Pacific College.

Five controlling purposes governed the investigation of the subject and the interpretation of the accumulated data. They were: (1) to inquire into the origin, developing objectives, and present position of higher education as related to the Free Methodist Church as a whole; (2) to trace the development of the individual schools; (3) to appraise the present status of Free Methodist Colleges with reference to their organization and control, administration, faculty, and student body; (4) to examine the objectives and the educational philosophies of the various schools; and (5) to investigate certain aspects of the educational product of two of the senior colleges.

It was observed that:

1. Although the Free Methodist Church at the time of its founding in 1860, expressed no immediate interest in organizing schools of collegiate nature, there was evidence of a real desire to provide educational opportunities above the common school level for its children. At the same time no parochial education system was envisioned.

2. Only one Free Methodist school was organized initially as a bona fide liberal arts college and even this one offered no collegiate courses during its first year. The others were called seminaries and enrolled students for all grades through high school. A gradual elimination of the lower grades permitted the schools to concentrate on their high school divisions until sufficient interest developed to warrant the transition to junior college status. Two of them continued the evolutionary process further and became senior colleges and a third obtained denominational approval in 1954 for such an advance in status. High school departments were eventually abandoned in all but four of the schools. One college continued its upward expansion to embrace the lower graduate level.

3. Ministerial training was to be accomplished by independent study. It was not until 1938 that authorization was given to permit ministerial candidates to meet educational requirements for ordination by proper selection of college courses.

4. While Bible study was to have a prominent place in the education of the students it was not to be accomplished at the expense of a thorough liberal education.

5. Lacking official restraint, individual initiative operated in founding schools without assurance of adequate



financial support or student patronage. In spite of this the mortality rate was not extremely high.

6. The denomination made no provision for centralized educational authority until most of the schools were in operation, then belated efforts were made to gain greater control of its educational enterprises. The trend continues toward making the schools more amenable to the denomination as a whole.

7. All of the schools showed an uninterrupted concern for the moral and spiritual development of their students and this concern was shared equally by constituents, controlling boards, administrations, and faculties.

By so doing the schools were anticipating a mid-twentieth century movement in higher education in which these same basic concepts were recognized and stressed.

8. Uniformity of purpose and practice was a distinguishing feature of Free Methodist higher education.

9. While a denomination-centered emphasis was thought to effect student enrollment, social and religious conservatism, characteristics of Free Methodist higher education, were not deterrents to growth.

515 pages. \$6.44 MicA 55-2050

## EDUCATION, PHYSICAL

### MEASUREMENT OF SELECTED OUTCOMES OF PARTICIPATION IN GIRLS' HIGH SCHOOL INTERSCHOLASTIC BASKETBALL

(Publication No. 12,880)

Mary Monroe Bell, Ph.D.  
State University of Iowa, 1955

Chairman: Professor M. Gladys Scott

#### Problem

Four possible outcomes of participation in interscholastic basketball were chosen from the areas of personality and human relations. These four outcomes were specific personality traits, social acceptability, social participation, and leadership ability. The purpose of the study was to determine if there was a difference in the four areas between girls who have participated in high school interscholastic basketball and those who have not.

#### Procedures

Tests were administered to high school students of the upper three grades of seven small Iowa high schools. Two hundred and forty-four girls were selected for the study. One hundred and nine had participated in interscholastic basketball and 135 had not. The tests which were used to measure the four outcomes included the California Psychological Inventory, a sociometric test, and a questionnaire which obtained information about the number of elective offices that each student held while in high school and the number of extracurricular activities in which she was currently participating.

#### Analysis

The analysis for three of the four outcomes was done by testing the significance of the difference between means of the two groups. A test of the null hypothesis was employed with respect to the relationship between participation in interscholastic basketball and the number of elective offices held during high school. This was done by testing the hypothesis that the percentage of office holders who were players was the same as the proportion of players in the total group of girls. A second analysis was done by comparing the two groups with respect to the outcomes after eliminating the twenty-nine girls who had participated in interscholastic basketball only one year. The five per cent level of confidence was selected for use in this study.

#### Conclusions

Significant differences were found between the groups on four of the ten scales of the California Psychological Inventory. The girls who played basketball were less feminine, more impulsive, and had a higher degree of social presence and self acceptance than the girls who had not played basketball. There was a tendency for the player group to receive higher scores on the dominance scale but this was not significant.

The girls who played basketball were selected more frequently by their classmates, both boys and girls, in a sociometric test involving situations of friendship and leadership than were the non-players. The player group held more elective offices and participated in more extracurricular activities than did the non-player group. The differences between the two groups were consistently more apparent when the one-year players were eliminated from the study.

105 pages. \$1.31. MicA 55-2051

### THE CONSTRUCTION AND STANDARDIZATION OF AN ARCHERY KNOWLEDGE TEST FOR COLLEGE STUDENTS

(Publication No. 12,870)

Carolyn Reid Hammond, Ed.D.  
Temple University, 1954

#### The Problem

The purpose of this study was to construct and standardize an archery knowledge test for college students which might serve as an objective measuring device within this field.

#### Procedure

The procedure followed was that recommended by authorities in the field of test construction. Curricular validity was established by analyses of textbooks and by judgments of competent persons.

A preliminary test including multiple-choice and true-false items covering the six accepted objectives was constructed and administered. The returned answer sheets were scored and statistically analyzed. The reliability of the test was computed and item validities and item difficulties were determined.

As a result of the statistical analysis, a revised and shorter form of the test was compiled and administered to archery classes in representative colleges in the different sections of the United States. The returned and completed 848 answer sheets were scored and presented in a frequency distribution. Out of a possible score of 90 the mean score was 44.3, the standard deviation was 9.78, and the standard error of the mean was .33. The reliability of the whole test was estimated to be .84.

An internal consistency item analysis was made. At the 5 per cent level, 93 per cent of the items discriminate in the beginners' group and 95 per cent discriminate in the intermediate group. At the 1 per cent level, 91 per cent and 90 per cent of the items discriminate for beginners and intermediate, respectively.

From a critical analysis of the item responses, it appeared that for both beginners and intermediates the questions on the technique of shooting were easier than items dealing with the other phases of archery. Students seemed to be least familiar with facts dealing with selection, care, and repair of tackle and with the history of the sport.

### Conclusions

1. The objective archery knowledge test, as here constructed, would appear to be both valid and reliable.
2. The test discriminates between levels of training in archery. Thus it would serve as an aid in classifying students for training purposes into relatively homogeneous groups.
3. The test is administrably economical in time and cost of materials.
4. The archery test may also help the instructor evaluate his teaching and the adequacy of the course content.
5. Test scores may aid in assigning course grades.
6. Relative scores in different phases of the test may be used in indicating strengths and weaknesses by topics.

155 pages. \$1.94. MicA 55-2052

### THE INFLUENCE OF CERTAIN NON-SCHOOL FACTORS ON CHILDREN'S RESPONSE TO A SIXTH-GRADE PHYSICAL EDUCATION PROGRAM

(Publication No. 12,604)

Esther Marcia LaRowe, Ph.D.  
University of Michigan, 1955

The problem of this study developed from the thesis that children's responses to their school physical education program are related to certain definable factors in their non-school environment. The problem is one of identifying these factors and of studying relationships concerning them.

Two hundred and ninety-five sixth-grade children of the Superior, Wisconsin, public schools and the parents of these children took part in the study.

Non-school factors were selected on the basis of information obtained through the use of interviews in which parents expressed their opinions and attitudes toward

physical education, talked about their own interests and experiences in physical education, sports and recreation and described what they believed were the play habits of their children when not in school.

Children's responses to their physical education program were determined through the use of specially devised performance tests and rating scales.

Parents' responses to interview questions served as a basis for grouping parents according to similar attitudes and experiences and also for grouping children according to similarities in their play habits. The performance tests and rating scales served as a basis for grouping children according to their response to the sixth-grade physical education program.

Comparisons were made between (1) selected groups of parents with respect to their attitudes toward the sixth-grade physical education program and to certain factors felt to be important in influencing the development of these attitudes, (2) selected groups of parents with respect to their children's response to the physical education program and (3) selected groups of children with respect to their response to the physical education program and to certain aspects of their play habits when not in school.

The chi square test of significance was used in obtaining statistical support for accepting or rejecting a Null Hypothesis concerning the groups compared.

Factors found to be significantly related to the responses of both boys and girls were concerned with (1) attitudes of parents toward physical education as expressed by the importance they attach to it (2) parents' evaluation of the physical education program (3) extent of parents' information about the program (4) the combined interest and participation of parents in sports or recreation and (5) extent of children's play with siblings.

Additional related factors for boys were (1) parents' approval of the physical education program and of after-school sports for sixth-grade children (2) parents' interest in sports events (3) parents' recognition of carry-over values in physical education (4) number of siblings (5) age differences of siblings (6) participation in after-school sports and team sports during the summer and (7) outdoor playmates.

Additional related factors for girls were (1) parents' activity in sports or recreation and (2) girls' outdoor playmates during the school year.

Findings of this study support the thesis that children's responses to their school physical education program are related to certain definable factors in their non-school environment. The nature and direction of influence of these factors probably differ for different children.

233 pages. \$2.91. MicA 55-2053



**THE EFFECT OF A WEIGHT TRAINING PROGRAM  
ON THE RETARDING EFFECTS OF EXCESS  
WEIGHT ON THE PERFORMANCE OF  
SELECTED ACTIVITIES**

(Publication No. 12,910)

Edward Preston Mitchell, III, Ph.D.  
State University of Iowa, 1955

Chairman: Professor Charles H. McCloy

The subjects used in this study were a cross section of the male freshmen students at the University of Iowa. Several of them were individuals whose physical fitness rating was so low as to cause them to be enrolled in the adaptive sections. Others were on the freshman athletic squads. The great majority were individuals with no superior ability, or with no serious physical handicap.

This study was undertaken to determine whether or not over weight, weight added artificially in this study, hampered performance in certain selected motor skills, and to what degree. Having established the hampering effects, it was planned to investigate the possibility that a weight training program would build strength in the individuals participating to the extent that the retarding effects of added weight would be minimized or overcome.

**Description of the Apparatus**

The testing instruments used in this study were described by McCloy.<sup>1</sup> The hand dynamometer was of the rectangular type. A tensiometer was used for the testing of the grip strength of the last two groups of subjects. This instrument was developed as a tool for the measurement of strength by Clarke<sup>2</sup>, and was adaptable to the testing of grip strength.

A back and leg dynamometer was also used for all back and leg lifts. Chinning was done on a horizontal bar set up in the gymnasium. Dipping was done on a set of parallel bars, also in the gymnasium. Shots, certified correct in weight, were used for the eight, twelve, and sixteen pound shot puts. In order that weight might be added to the subjects without undue bulk and discomfort, jackets made of canvas and resembling suspenders with a belt were made. In the shoulder straps and belt of each jacket were pockets into which lead weights could be placed. The same type jackets as first described by Brady<sup>3</sup> were used. The exception in their construction being that there were pockets in which weights could be inserted. These pockets were not used until the last testing series, in which fifteen percent of the subjects body weight was used.

Apart from the mechanical apparatus, a chart, graduated in centimeters, was used to measure the heights jumped in the Sargent Jump.

**Collection of the Data**

The subjects met at the regular class times during the entire semester, a sixteen week period, and were given credit for having attended classes in physical education. There were two two-hour periods per week. The subjects used were selected from among those who had volunteered to act as subjects after the nature of the problem, and what would be expected of them, had been explained. This was done in an effort to secure individuals who would do their best in all phases of the experiment.

For several periods the subjects met and were

instructed in the techniques of the Sargent Jump, the shot put as it was used in this study, and the sprint start using the bunched technique. This the writer has shown that from the results of this study it can be said that weight training did build up the strength of the subjects participating, and that to a large degree the added strength was able to overcome the handicap of weight added artificially.

In every instance the performances with the five percent added weight of the final series were superior to those with no weight added in the initial series. Further, in some of the tests, the gains were maintained with even more addition of weight. In the final performance of the Sargent Jump with ten percent of weight added, the mean was better than that of the initial performance with no weight added. Also, the back and leg lifts with maximum weight added of the final series of the tests, were superior to the initial performances without weight added.

During both the initial and final testings with the shot put, it seemed that the subjects were hampered both by the heavier shots and by the percent of weight added. Subjects that were familiar with the activity were much less hampered by the added percentage of body weight. They seemed able to get more of the body's mass behind the shot.

The increase of the Sargent Jump was considerable, approximately four inches in the trial without weight added. The drop-off was quite large, however, with the addition of five percent of body weight. The addition of the ten and fifteen percentages in subsequent trials did not result in so marked a drop-off as did the five percent addition.

The tests used only in the trials without weight added also showed great improvement. The very good percent of improvement indicates that the improvement was as stable as that of any of the other tests.

The results would seem to indicate that by participating in a weight training program an individual can increase his strength to the degree that he will be able to maintain superior performances under heavier loads than previously.

82 pages. \$1.03. MicA 55-2054

1. C. H. McCloy and Norma D. Young, *Tests and Measurements in Health and Physical Education*,<sup>3</sup> p. 148

2. H. Harrison Clarke, *Cable-Tension Strength Tests*.

3. George F. Brady, "The Effect of Excess Weight Upon Motor Skills." (Ph.D. Dissertation, State University of Iowa, 1952, pp. 16-17.)

**A SURVEY OF HEALTH AND PHYSICAL EDUCATION  
PROGRAMS IN THE PUBLIC SECONDARY SCHOOLS  
OF TEXAS BY MEANS OF THE LAPORTE  
SCORE CARD**

(Publication No. 12,656)

Maybelle Tinkle, Ed.D.  
University of Michigan, 1955

The purpose of this study is to survey and evaluate the health and physical education program of the boys and girls in the public secondary schools of Texas by means of the LaPorte Health and physical Education Score Card No. II combined with a supplementary check-list, and to determine the relationship of geographical area, city size,

school size, and accreditation to the quality of the program.

The data were collected by personal visitation, observation, and interview in one hundred high schools for white students selected by a stratified random sampling technique with probability proportional to the number of students. Percentages, cumulative frequency distribution curves, bar graphs, and "t" test of significance were the techniques used for the statistical treatment of the data. The findings on the boys' and the girls' situations were presented separately and in three parts: an analysis of the total situation, an analysis of each of the ten divisions, and an analysis of the items under each division.

The highest possible number of points that could be scored on the total situation by use of the LaPorte Score Card No. II was three hundred points. The Texas boys' total health and physical education situation, with a mean score of 119.80 points, was 39.93 percent effective according to the rating standards of the score card, and would be considered as poor to average by those standards. Compared to the situations evaluated by similar studies in other states, the Texas boys' situation was as effective in its approach to the theoretical program as the others. One-fourth of the school population had programs for boys ranging from 147.5 to 190 points, one-half from 97.5 to 147.5 points, and one-fourth from 40 to 97.5 points. Geographically, the total situation of the southwest area of the state was better than that of the northeast. The towns with populations of five thousand or more had better programs than the smaller ones. The comparison of school size indicated that the larger the school tended to be, the better the program ranked. The schools accredited by the Southern Association of Colleges and Secondary Schools had significantly better situations than those in the non-accredited schools.

The girls' total situation had a mean score of 124.60 points, indicating that it was 41.53 percent effective in achieving the ideal. One-fourth of the school population had situations for the girls ranging from 154.50 to 196 points, one-half from 101.17 to 154.50 points, and one-fourth from 41 to 101.17 points. Geographical location was not pertinent to the quality of the girls' situation. City size, school size, and accreditation comparisons showed the same relationship to the quality of the girls' situation as that of the boys'.

General conclusions can be drawn from the study that there was a wide range in the quality of the health and physical education programs. The larger schools usually had the higher scores, the smaller schools the lower scores. To maintain or raise standards in the program, more statewide supervision and direction is desirable and necessary. The most serious defects that need to be corrected are the following: inadequate provision of supplies, equipment, and facilities for physical education classes; poor program planning on the part of health and physical education teachers; too little being done to meet individual needs of students; lack of adequate attention being paid to the actual teaching of physical education; the practice of permitting other subjects or activities to be substituted for physical education classwork; assignment of students to a physical education class according to periods they have free rather than on a more selective basis; over-large size of classes especially in the large

schools; poor medical and health services; and insufficiently planned and conducted intramural athletic programs.

300 pages. \$3.75. MicA 55-2055

# THE COMPARATIVE RELATIONSHIP OF HIGH SCHOOL PHYSICAL EDUCATION PROGRAMS IN TENNESSEE TO THE DEVELOPMENT OF STRENGTH AND MOTOR ABILITY OF COLLEGE WOMEN

(Publication No. 12,664)

Helen Belle Watson, Ph.D.  
University of Michigan, 1955

The purpose of this study is to investigate the comparative relationship of high school physical education programs in Tennessee to the development of strength and motor ability of college women. This investigation was made by determining whether good high school physical education programs for women in Tennessee resulted in measurable differences in the strength and motor ability of the college women who participated in these programs. The differences were determined by comparing students who had experienced good high school programs with those who had experienced average or poor programs.

The secondary problems of the study consisted of a comparison of the subjects representing good high school physical education programs with those representing average and poor programs in 1) the amount and variety of recreational participation during the last two years of high school, 2) the amount of participation in physical activities during childhood, 3) the amount of participation in non-active forms of recreational activity during childhood, and 4) a selected group of factors which may have influenced childhood participation in physical activities. The subjects who played varsity basketball in high school were compared with those who represented good, average, and poor high school physical education programs in strength and motor ability as well as with the other four items listed above.

The subjects selected for use in this study were 486 of the freshmen and sophomore women enrolled in regular physical education service courses at the University of Tennessee. The Scott motor ability test for college Women and a strength test consisting of the grip, push and pull, were used to determine the motor ability and strength of the subjects. A three-part questionnaire was utilized for measuring recreational participation during the last two years of high school, childhood experiences, and recreational interests.

The high school physical education programs from which the subjects came were rated good, average, or poor by a jury composed of thirty-four Tennesseans including the State Director of Physical Education, city supervisors of physical education, the regional secondary school supervisors, and individuals selected from the faculties of colleges concerned with the professional preparation of women physical education teachers in the three regions of the state.

The results of the study show that the subjects who



came from good high school physical education programs, when compared with those subjects who came from average and poor high school physical education programs, 1) have more motor ability, 2) are not significantly different in strength, and 3) are not significantly different in the amount and variety of participation in recreational activities during high school. The subjects both from the good and average programs showed a greater amount and variety of participation in recreational activities during high school than the subjects from the poor high school programs. The significant differences between the groups were computed in strength, motor ability, and recreational participation during the last two years of high school.

On the basis of the results from this study the following conclusions were drawn:

1. Physical education programs for women in the high schools of Tennessee contribute to the development of motor ability.
2. Physical education programs for women in the high schools of Tennessee do not make a significant contribution to the development of strength.
3. Women whose high school physical education programs in Tennessee are rated as good participate in more recreational activities during high school than those whose programs are rated as poor. Women whose programs are rated as good do not participate in more recreational activities than those whose programs are average.

203 pages. \$2.54. MicA 55-2056

**PHYSICAL FITNESS AND PERFORMANCE  
OF A MEDICALLY HEALTHY GROUP OF  
ADULT MALES OF MONGOLOID AND  
MELANESIAN RACIAL ANCESTRY**

(Publication No. 12,665)

Robert Edward Wear, Ph.D.  
University of Michigan, 1955

The purpose of this study is to investigate the physical condition and ability of 471 Mongoloids and 62 Melaneseans through the use of physical fitness tests and measurements.

Two major groups are considered. The first group is composed of 471 adult males ranging in age from seventeen to fifty six years. The best descriptive phrase to use for the population from which this group is derived appears to be the racial designation of "small mongoloid racial type" as used by Physical Anthropologists.

The second group numbers 62 adult males and may be classified as Melanesian in the ethnic sense of the word. Racially they are mixtures in varying degrees of Small-Mongoloid, Negrito-Papuan, and Mediterranean-White racial stocks.

There is no way to determine precisely that these groups are random or representative samples of the popu-

lations from which they are derived. All people were medically screened and may be described as healthy, free of defect or handicap and adequately nourished.

The data consist of age, the measures standing height and weight, and physical performance tests for the following items: Pull-ups, Standing Broad Jump, Squat Thrusts, Sit-Ups, Sixty-Yard Dash, 300-Yard Shuttle Run, Push-Ups, Vertical Jump, and Squat Jumps.

This evidence was obtained on 533 adult males residing in the geographic regions of Eastern Asia and Melanesia for pretests and upon 290 men for post-tests. After medical screening and preliminary orientation, the pretest was administered. The groups were then given a reaction and conditioning program which was followed by post-tests.

The data were statistically reduced in terms of class and group to the following generalizations: the number, range, mean = standard error, the standard deviation, and the range of the distribution of one standard deviation on either side of the mean. All mean differences by class and by group were taken and the significance of these differences was computed using the standard error of difference of two means technique. Analysis of these results indicates that there are significant differences between classes within groups at both pretest and post-test levels. There are more significant differences between groups at both pretest and post-test than there are between classes within groups. It is noticed that the conditioning program produces significant differences between pretest and post-test periods in all events except the sixty-yard dash and the 300-yard shuttle run. These findings show that the conditioning program was effective.

An analysis of photographs taken of 175 Mongoloids according to the Sheldon system of somatotyping indicated that only one somatotype - 252 - was identifiable and that the main differences were variations in the amount of muscle tissue in the same general physical type. This group may be classified as well muscled.

The Mongoloid population was regrouped according to age levels and analysis shows that the differences between each age group relative to performance were highly significant at pretest and post-test and for pretest and post-test differences.

According to the comparative standards of physical fitness as indicated by the United States Army, the United States Office of Education, and the United States Navy standards of appraisal, it may be concluded that the general level of physical condition for both Mongoloid and Melanesian groups was low at pretest, had improved at the post-test level, but was still somewhat deficient. Especially noticeable is the low standard of performance and inability to improve in the running events and the good comparative scores achieved by the Asiatics in the squat thrusts, push-ups, and squat jumps.

195 pages. \$2.44. MicA 55-2057

## EDUCATION, PSYCHOLOGY

BEHAVIOR ANOMALIES AND  
SCHOOL ADJUSTMENT

(Publication No. 13,067)

Margaret Louise Baumann, Ph.D.  
Northwestern University, 1955

Children whose behavior is disturbing or is noticeably different from that which the culture accepts are found in all classrooms in the elementary school. These children make learning difficult for themselves and for their classmates. Their unrewarding and frustrating experiences in school may well result in neuroticism in their later lives. The writer believes that such children can be identified and aided effectively by means of group therapy. This study describes a plan for aiding the inadequately adjusted child.

To this end, the first problem was one of identification. The writer worked in a Chicago elementary school having an enrollment of 802 pupils. Intelligence tests were given, and any child not mentally competent was eliminated. She eliminated also those children who had gross physical disability.

A behavior check list was devised and submitted to the teachers. This list was filled out for each child who a teacher thought was inadequately adjusted. The children were selected from these reports, and a few others were added after parents' reports had been confirmed by further teacher observation.

One hundred and eight children made up the final group of inadequately adjusted pupils.

The second problem was one of analysis. A deprivation-satisfaction score card was devised which covered seven areas: the physical, the mental, the emotional, the social, self-confidence, culture knowledge, and vocational skills. It was felt that since disruptive behavior is in part a result of the deprivation of basic needs, the needs of each child and their relative fulfillment should be examined. To obtain data, parents, siblings, teachers, and the children themselves were interviewed. The California Test of Personality was administered and reading and arithmetic tests were given to the 108 pupils.

The third problem was one of setting up the corrective program. A group therapy plan was devised to give the children an opportunity to have satisfying experiences. The adjustment teacher, a cadet teacher, and the writer provided twelve weeks of therapy. The children were placed in three groups: one made up of kindergarten and grades one and two; another, of grades three, four, and five; and another, of grades six, seven, and eight. The second two groups were again divided — each into an experimental and a control section. The former received therapy; the latter did not. While the children remained in a group situation, instruction was handled so that the special needs of each child were met. Flexibility, sensitivity to moods, willingness to try out the unconventional, were characteristics of the program.

The fourth problem was one of evaluation. The California Test of Personality was again administered; a second behavior check list was filled out for each child; school grades were examined; variations in the number of times pupils were involved in discipline situations were observed. The differences in the results on the California

Test of Personality administered at the beginning and at the close of the experiment were treated statistically. Statistical evidence supports other observation showing that the group therapy program was effective in producing desirable behavior changes.

Since the statistics indicate that significant changes resulted, and since this program could be adapted to fit the specific needs of any elementary school; this study may point the way to an effective procedure that might be used more often in our schools.

336 pages. \$4.20. MicA 55-2058

THE DEVELOPMENT AND INITIAL VALIDATION  
OF AN INSTRUMENT DESIGNED  
TO APPRAISE CERTAIN ASPECTS  
OF TEACHER JOB SATISFACTION

(Publication No. 13,317)

Norman Dale Bowers, Ph.D.  
University of Minnesota, 1955

The primary object of this study was the construction and presentation of certain validating evidence about an attitude measuring instrument, the Teacher Opinion Inventory. This inventory was designed to differentiate among teachers on the basis of their satisfaction with teaching as a profession. Responses to the 219 items comprising the Teacher Opinion Inventory, biographical data and self-ratings were obtained from three different samples of elementary school teachers, including (a) ninety-five Minnesota teachers selected as "better-satisfied"; (b) thirty-two Minnesota teachers selected as "less-satisfied"; and (c) one hundred teachers drawn at random from the 388 white elementary teachers of Escambia County, Florida. Additional information from the Escambia County, Florida, teachers included responses to the Minnesota Teacher Attitude Inventory, the Minnesota Personality Scale, the Hoppeck Job Satisfaction Blank, and three principals' Ratings. It was concluded that the Teacher Opinion Inventory had content validity to the degree that 113 of the 219 items discriminated ( $P < .20$ ) between the "better-satisfied" and "less-satisfied" teachers. Item response weights were developed by the method of reciprocal averages. Evidence of congruent validity was obtained in that the Teacher Opinion Inventory correlated with the Hoppeck Job Satisfaction Blank ( $\eta = .729$ ) and the Minnesota Personality Scale, Part V: Economic Conservatism ( $r = .283$ ). These relationships were both significant at the one per cent level of confidence. The product-moment correlation of the Teacher Opinion Inventory with the Minnesota Personality Scale, Part IV: Emotionality was .222 (significant at the five per cent level). The Teacher Opinion Inventory had a nonsignificant relationship with the Minnesota Teacher Attitude Inventory and with Part I: Morale, Part II: Social Adjustment, and Part III: Family Relations of the Minnesota Personality Scale. A degree of concurrent validity was indicated by relationships, significant at the one per cent level, between Teacher Opinion Inventory scores and principals' Ratings II ( $r = .378$ ) and the Combination of Rating I and Rating II ( $r = .465$ ). A relation, significant at the .05 per cent level was obtained when Teacher Opinion Inventory scores were correlated to



principals' Rating I ( $r = .233$ ). Further evidence of the concurrent validity of the Teacher Opinion Inventory was shown by the mean Teacher Opinion Inventory scores discriminating ( $P < .01$ ) between (a) the group of teachers who were members of their local teachers' association and those who were not members; (b) the group whose members held office in their local teachers' association and the group of non-office holders; (c) the two groups whose self-ratings were at least one standard deviation above or below the sample mean, and (d) the three groups of teachers classified according to their current professional reading. On the basis of obtaining a reliability coefficient of .958 by the method of analysis of variance, it was concluded that the Teacher Opinion Inventory had an acceptable degree of internal consistency. Results of this investigation indicate that attitudes towards teaching may be used as a measure of teacher satisfaction, and the Teacher Opinion Inventory is potentially useful in the selection of staff personnel and the measurement of teacher characteristics.

327 pages. \$4.09. Mic 55-265

#### HYPOXIA DURING THE EMBRYO STAGE AND ITS EFFECTS UPON PHYSICAL AND NEURAL DEVELOPMENT IN THE CHICK

(Publication No. 12,201)

Frederick Douglas Breslin, Ph.D.  
New York University, 1955

The purpose of the present study is to investigate the post-hatching effects produced in a group of chicks by a reduction in the available oxygen at varying stages in the developmental period. The method used was to compare statistically a control group with a number of experimental groups.

Three experimental approaches were used in this study: the first pilot study, the second pilot study and the experimental study. In both pilot studies the embryos were divided into one control group and three experimental groups (A, B and C): Group A consisted of embryos in the third week of development. Group B consisted of embryos in the second week of development and Group C consisted of embryos in the first week of development.

In both pilot studies the hypoxic situation was maintained for a period of five days; however, during the first pilot study the available oxygen was maintained approximately at a 7 per cent level while in the second pilot study the available oxygen was maintained at a 10 per cent level.

The experimental study differed from the two pilot studies in that the available oxygen was increased to 14 per cent; the hypoxic period was shortened to 48 hours and the control group was taken from another study to obtain data on a larger number of embryos.

In the first pilot study where the oxygen was reduced to 7 per cent, it was found that the older embryos tended to withstand the hypoxia best. Those in the third week of development, Group A, showed no signs of any effect. Group B in the second week of development lost 45 per cent of the hatch. Group C in the first week of development lost 100 per cent of the hatch by the end of the second day.

These findings were not substantiated in the second pilot study where the embryos in the initial stages of development had a slightly above normal hatch.

The experimental study reinforced the findings of the second pilot study. The embryos in the first week of development, Group C, had a larger and apparently more viable hatch than the control group. However, there were also 1.7 per cent head anomalies which is eight times greater than expected for a group this size.

The brain and spinal cord of chicks displaying neurological disturbances were removed and examined for lesions. In none of the cases examined were any unusual changes, structural or otherwise, noted.

Some conclusions arrived at as a result of this experiment were:

1. In an extreme hypoxic situation the earlier the stage of development in the chick embryo the less chance the embryo has of survival.
2. Beneficial as well as detrimental results apparently may come from a hypoxic situation. Despite the one-third oxygen reduction, Group C, the group in the first week of development, in the experimental study, emerged with a larger and apparently more viable hatch than the control group.
3. While the finding of increased head anomalies in Group C of the experimental study was not statistically significant there is still some indication that certain types of head anomalies are related to oxygen lack.

Some recommendations made as a result of this study are:

1. The entire experiment should be repeated in conjunction with an embryological study to determine if possible the factors present capable of producing the results found in this study.
2. Further examination of embryonic development should be made to determine if hypoxia can bring about genetic changes through its effect upon the formation of desoxyribose nucleic acid.
3. Research should be carried out using mammals to determine if the results of this experiment could apply to placental animals.

81 pages. \$1.01. Mic 55-266

#### AN INVESTIGATION OF THE RELATIONSHIP OF THREE TEACHING METHODS TO STUDENT BEHAVIOR IN A HOW TO STUDY COURSE

(Publication No. 13,324)

William Walter Farquhar, Ph.D.  
University of Minnesota, 1955

Adviser: C. Gilbert Wrenn

#### The Problem

The main purpose of the thesis is to compare the relative effectiveness of three methods of teaching a how to study course in terms of student change in knowledge of course material and student change in report of study behavior. In addition, the subsidiary problems of the relationship of student preference for certain types of instruction

or student level of ability to the three methods of instruction are investigated.

#### The Design

All six sections of the Winter 1955, How to Study classes in the General Studies Department of the College of Science, Literature, and Arts of the University of Minnesota were the subjects of the investigation.

Students who elected the How to Study course were interviewed and randomly assigned to either the morning or afternoon instructor's sections. Two instructors participated in the investigation and each taught three classes using three methods of instruction.

The three methods of instruction were student-centered with a primary emphasis on the emotional aspects of the classroom, instructor-centered with a primary emphasis on the intellectual aspects of the classroom, and eclectic with a dual emphasis on emotional and intellectual aspects of the classroom.

The instructors coordinated their planning throughout the experiment. To check the consistency of the roles, the students rated the instructors on an eight item scale developed from the operational definitions of the methods and raters analyzed one full day of class recordings. The analysis indicated that the roles were successfully portrayed.

#### The Instruments

A pre- and post-administration of a final examination that was constructed for the investigation, and the Brown-Holtzman Survey of Study Habits and Attitudes (the SSHA) were used to evaluate student change. Because the SSHA has sex-differentiated scoring keys and there were only a few females in the sample, the analysis of results of the SSHA was restricted to males.

By Hoyt's analysis of variance technique, the internal consistency reliability was estimated to be .67 and .88 for the pre-administration of the final and SSHA respectively and .64 and .91 for the post-administration.

Student preference for instruction was measured by the Preferred Instructor Characteristics Scale (the PICS) which was developed by the instructors of the investigation. Arbitrarily the PICS was scaled so that a high score indicated preference for an instructor who emphasized the cognitive aspects of the classroom; a low score the affective aspects. An internal consistency reliability estimate of .90 was found by the Hoyt method.

Student ability level was assessed by the 1952 form of the ACE.

#### The Analysis

The analysis of variance and covariance technique for unequal frequencies in the sub-groups was used to test the hypotheses of the investigation. The assumptions of normality and homogeneity of variances were tested by plotting the group distributions on probability paper and by Welch's  $L_1$  test.

No differences were found in the mean scores of either criterion instrument which were traceable to the three methods of instruction or to the three ACE ability levels.

To investigate the subsidiary problems, the student's PICS and ACE raw score distributions were divided into thirds yielding a low, medium, and high group.

The only significant relationship found in the investigation was between the three levels of the PICS male SSHA scores.

An inspection of the group means revealed that the male PICS group who scored in the direction of preferring teachers who emphasized cognitive aspects of teaching increased their self-ratings on the SSHA, the middle group made no apparent change, and the group scoring in the direction of teachers who stress the affective aspects decreased their self-ratings over the period of instruction. There were no differences between the three PICS groups in final examination scores.

286 pages. \$3.58. MicA 55-2059

### AN ANALYSIS OF CERTAIN LEARNING DIFFICULTIES OF CHINESE STUDENTS IN NEW YORK CITY

(Publication No. 12,218)

Peter Te Yuan Hao, Ed.D.  
New York University, 1955

#### Statement of the Problem

The purpose of this study was to determine whether Chinese students enrolled in the universities of metropolitan New York City had learning difficulties which affected adversely their academic performance.

#### Significance of the Problem

While the presence of Chinese students in this country has been an important factor in bringing about friendly relationship between the United States and China, the Chinese students have had many difficult problems in adjusting to the American college. The college teachers have become aware of the Chinese students' difficulties and deficiencies in the English language. However, little has been done to improve the situation. The writer believed that an intensive study of the learning difficulties of Chinese students would be helpful in providing better opportunities for the Chinese students in the American college.

#### Previous Research

There have been many studies concerning the diagnosis of reading disabilities. The majority of these researches have used objective tests and have sought the factors of reading comprehension and relationship between average grade and reading ability. None of them was concerned with Chinese students. It was found that the success of a Chinese student in American was correlated highly with knowledge of English. Little has been done in connection with the students' learning difficulties. Many studies concerning intelligence and cultural differences have indicated that most marked linguistic retardation was attributed in part to the environmental conditions. I.Q. differences among pupils of differing cultural backgrounds should be interpreted with extreme caution.

#### Procedure in Collecting Data

One hundred thirteen China-born students at Columbia, Fordham and New York Universities were given the American Council on Education Psychological Examination for College Freshmen, 1949 edition, the Michigan



Vocabulary Profile Tests, and the Cooperative Reading Comprehension Test C2, Form Y. The norms used were those provided for American students by the publishers of the tests. General and specific information of each student was collected by the use of a check list constructed by the investigator. College grades of each student were obtained from the recording offices of the respective universities. As students were interviewed they indicated what they thought were the causes for their vocabulary and reading difficulties.

The means and standard deviations were calculated for the distributions of each set of test scores. The test scores of the Chinese students were compared in several ways: (a) Chinese doctoral candidates, master's candidates, and undergraduates; (b) Chinese men and women students; (c) Chinese students in Columbia, Fordham, and New York Universities; (d) Chinese students specializing in different fields of study; (e) Chinese students with American students. The t-test and analysis of variance were used in evaluating the data. The Pearson product moment coefficient of correlation was used to determine the relationship between the respective tests and the average college grade. Multiple regression equations for predicting the average college grade were computed. Biserial correlation and the contingency coefficient were used in determining certain relationships where the check list data and test scores were involved.

#### Conclusions

The Chinese students in this study proved to have vocabulary and reading difficulties which did affect adversely their academic performance. All their test scores except the ACE Quantitative score were significantly inferior to those made by the American college freshmen. The learning difficulties of Chinese students were found linguistic rather than quantitative in nature. The linguistic difficulties in vocabulary and reading which were significantly related to the average grade of the doctoral candidates at New York University were considered hindrances in their academic work. The factors which were significantly related to the results of the tests were the length of residence in the United States, the length of study in American schools, the academic and extracurricular successes of the students.

373 pages. \$4.66. Mic 55-267

#### A STUDY TO DETERMINE HOME CONDITIONS AND INFLUENCES WHICH SEEM TO BE ASSOCIATED WITH THE DEVELOPMENT OF HIGH SCHOOL LEADERS

(Publication No. 12,987)

Kenneth Harding Hoover, Ed.D.  
University of Washington, 1955

The purpose of this investigation was to determine, through parental interviews, home conditions and influences which seem to be associated with development of certain school leadership traits. Selected subjects, consisting of 204 high school seniors from twelve selected schools in the Puget Sound area of Western Washington, were divided, by sex, into leader and non-leader groups. Areas

of investigation included a comparison of the groups in terms of family methods and procedures relating to child training, family policy and control, family status, and certain miscellaneous problems.

Results of this study have been separated according to the degree of significance found between the leader and non-leader groups. Highly significant factors indicate critical ratios significant at the .01 per cent level of probability. Factors of marked significance represent critical ratios significant at the .025 per cent level of probability. Slightly significant factors denote critical ratios significant at the .05 per cent level of probability.

Highly significant differences, favoring leaders, indicated that they had been subjected to ample praise and reasoning during the formative years; had performed ample work-assignments both in and out of the home; had assumed primary responsibility of managing the home, for a week or more, prior to senior high school age; had regularly attended church, along with their parents, during the formative years. Also surpassing non-leaders, the leaders came from homes adequately equipped with recreational facilities and frequently opened to friends; they were interested in active as well as quiet activities and had been leaders in non-school groups by junior high school age; decision-making relating to moral standards, by the senior year in school, was usually left to the leader; family planning and sharing of decisions were common practices in the homes of leaders; their parents were generally professional or skilled workers rather than unskilled; the fathers of the girl leaders were usually home in the evenings; leaders had higher scholastic aptitude scores than non-leaders.

A factor of marked significance, favoring leaders, indicated that leaders frequently earned spending money from outside employment in preference to a regular spending allowance.

Slightly significantly in favor of leaders were these: income from outside work was used for such items as school supplies and certain articles of clothing in addition to spending money; leaders had gained work-experience concurrent with school which, for boys, had begun during the junior high school age; the second boy from a family of three children was favored.

Some factors were significantly associated with non-leaders. Those factors were: the parents preferred corporal punishment, as the chief corrective method, during the formative years; the subjects usually sought quiet entertainment; the presence of persons living in the home, other than members of the immediate family, was common.

Influences and conditions which appeared to have little relationship to leadership or leadership development were: age for beginning regular spending allowances; work-experience during the summer months; family church denomination; influences of mothers, who had been employed almost continuously since marriage; working hours of regularly employed mothers.

254 pages. \$3.18. MicA 55-2060

# THE EFFECTS OF COUNSELING ON THE SELF-PERCEPTIONS OF COLLEGE MEN

(Publication No. 13,331)

Carl Frandall Jesness, Ph.D.  
University of Minnesota, 1955

The purpose of this thesis was to determine the effects of counseling on the self-perceptions of a group of college men. Students in freshmen college English classes were asked to indicate how interested they were in receiving counseling for any of their problems associated with vocational planning or social relations. Random selection procedures were then used to select a control and an experimental group from the pool of "very interested" students.

Members of the experimental group (n=31) received an average of 4.7 hours of counseling. The time between the pre- and post-test period averaged 3.4 months. Counseling of the control group (n=29) was delayed for an average of 2.4 months. Tests were administered to the controls at the beginning and end of this wait period.

The operational definitions of the criterion variables called for two different kinds of measures: self-ratings by the subject and other-ratings made by skilled observers. The self-ratings consisted of the subject's estimate of his status on eleven problem-need areas as compared with other college students, his reaction (attitude) toward these perceptions, his estimate of others' opinions of his status, and the intensity (certainty and involvement) of his feeling about each of these ratings. Each estimate was made on an eight point graphic rating scale. The second measurement, an estimate of "reality", was an independent estimate of the subjects' status compared with other college students made by three experienced counselors using extensive data. Testing the validity of the several criterion variables defined by these dimensions both considered singly and in combination against an independent rating of adjustment was an important first-step in the study.

An analysis of covariance was then carried out to test the hypothesis that compared with a control group of students motivated for counseling those students who received counseling will show significant changes on several variables which would indicate that they have achieved: 1) greater insight and more accurate self-perceptions, 2) greater acceptance of their real feelings and less defensiveness, 3) more satisfaction with themselves, 4) fewer perceptions of self-other differences, 5) clearer and more stable self-perceptions, 6) less tendency to deny common values, 7) more satisfaction of basic needs, 8) higher self-esteem and 9) a more adequate, mature adjustment.

In addition to testing the effects of counseling on these theoretically derived general outcomes, the sampling procedure of the study enabled an additional analysis to be made of the changes in the specific problem area of vocational planning.

The results of the analysis of pre- and post-scores on the general outcome variables indicated that during the experimental period both groups experienced a significant improvement on almost all the variables. An analysis of covariance, however, failed to indicate significant experimental group superiority on any of the single indices although the tendency was in that direction.

Analysis of outcomes in the specific area of Vocational Planning revealed that sixteen experimental subjects had changed to new vocational goals compared with seven controls. In addition the counseled students clearly tended to select occupations which were more appropriate to their aptitudes and interests.

It was concluded that 1) there are a number of dimensions of an individual's self-perceptions which are related to an independent rating of adjustment, 2) personality can be most accurately assessed by considering both internal reality (self-evaluations) as well as external reality (other-evaluations), and 3) counseling appeared to have significant effects on the specific problems presented by clients. The results tend to emphasize the importance of a motivated control group in studies of this kind. It is also clear that effects of counseling may often be most clearly revealed by attending to specific rather than general outcomes.

224 pages. \$2.80. MicA 55-2061

# THE ADEQUACY OF CERTAIN MEASURES USED IN THE SELECTION OF FRESHMAN STATE AND MERIT SCHOLARSHIP RECIPIENTS AT INDIANA UNIVERSITY

(Publication No. 13,221)

William Alten Jones, Ed.D.  
Indiana University, 1955

The principal purpose of the study was to aid in the formulation of criteria which might serve as guides in the selection of the most scholastically qualified students for scholarship awards. To accomplish this, the measures used in the selection of freshman State and Merit scholarship recipients at Indiana University in 1953 were investigated. The first objective of the study was to determine the efficiency of high school rank and the Indiana State Scholarship Test for High School Seniors in indicating students of high academic promise; the second objective was to analyze the performance of the scholarship recipients on the Indiana State Scholarship Test.

## Methods of Procedure

The first procedure sought differentiations on various measures within the scholarship group and between the scholarship group and a non-scholarship group made up of students who ranked at the same ACE Psychological Examination total percentile rank. Further differences were investigated between the students who retained a scholarship and non-scholarship students who earned credit point ratios above the scholarship cut-off grade point average at the end of the first semester. Similarly, differences were investigated between the students who lost a scholarship at the end of the first semester and non-scholarship students who earned credit point ratios below the scholarship cut-off grade point average.

The relative value of high school rank and Indiana State Scholarship Test as predictors of first semester credit point ratio was compared with the predictive value of ACE Psychological Examination, Cooperative English Test, C2, and Cooperative English Test, OM.

Further analysis was made of the Indiana State



Scholarship Test in terms of its ability to discriminate between the students who retained scholarships and the students who lost scholarships.

#### Analysis of the Data

When the mean performance of the students who retained scholarships was compared with that of the students who lost scholarships, greatest differentiation was found between the means for high school rank. The differences between the means of the groups on Cooperative English Test, C2, and Cooperative English Test, OM were found to be significant at the five per cent level of confidence, while no significant difference was found between the means on the ACE. The differences between the means of the scholarship group and the non-scholarship group were significant at the one per cent level of confidence, with the exception of the difference between mean credit point ratio of the students who lost scholarships and the non-scholarship students earning credit point ratios below the scholarship cut-off grade point average.

The investigation of the predictive value of the scholarship selection measures showed that high school rank dominated by a large margin the predictive value of the Indiana State Scholarship Test. When other variables were added, a statistically significant improvement in prediction was noted. The regression equations showed that greatest predictive value was supplied by high school rank and Cooperative English Test, C2.

An Item analysis of the performance of the scholarship students on the Indiana State Scholarship Test revealed no significant discrimination between the students who retained and the students who lost scholarships. Further analysis of the test by the use of the discriminant function substantiated the homogeneity of the scholarship group; however, the relative value of the subtest scores for predictive purposes were found to be too small for accurate use.

#### Conclusions

The findings show that high school rank was more efficient than the Indiana State Scholarship Test, not only in predicting academic performance but also in supplying a reliable distinction between the students awarded scholarships. The results also indicate a need for further work in improving the discriminating power of the test.

140 pages. \$1.75. MicA 55-2062

#### THE UTILITY OF THE COLOURED PROGRESSIVE MATRICES

(Publication No. 13,222)

Thomas Edward Jordan, Ed.D.  
Indiana University, 1955

**Statement of the Problem:** The purpose of the study was to investigate the utility of the Coloured Progressive Matrices, a non-verbal test of intelligence based on the theoretical formulations of Spearman, with particular attention to its value as a predictor of school success and achievement in a sight vocabulary.

**Procedures:** A random sample of 200 first grade children was obtained and the Coloured Progressive Matrices was administered to them using a method of administration designed to yield some of the advantages of both group and individual testing procedures.

Five months later two measures of school success were obtained and used as validating criteria to determine the value of the test as a predictor of school success. The two criteria were (1) a subjective appraisal of the success with which each pupil completed the semester's school work reported as a rank in the group, and (2) an objective measure, achievement on the Dolch Basic Sight Word Test.

**Results:** Correlation coefficients were obtained between the Coloured Progressive Matrices and the two validating criteria. A range of coefficients between .14 and .37 was obtained between the Matrices test and school success as judged by teachers. A range of rank correlations from -.16 to .78 was obtained between the Matrices test and achievement on the Basic Sight Word Test. Both sets of coefficients were too low to assure valid predictions of school success based on the Coloured Progressive Matrices.

**Conclusions:** (1) The Pearson coefficients of correlation between the Matrices test and the validating criteria were low and do not justify the use of the test as a predictor of school success.

(2) From observations made during the administration of the Coloured Progressive Matrices Test it was concluded that the Matrices test has high interest value for young children of a wide range of mental ability.

(3) Since the Matrices test was administered in a short time and scored with a minimum of difficulty it was concluded that it is economical of time and effort.

(4) Since the Matrices test and the Basic sight Word Test both use visual discrimination, and since the correlations between the two tests were low, it was concluded that reading achievement cannot be predicted from an intelligence test which relies exclusively on visual discrimination.

(5) Since the investigator used the test, formerly, with handicapped children, and since the subjects in the study were non-handicapped and did the tasks with ease and a great deal of interest it was concluded that the test is promising and is worthy of further study with a view to its employment with non-handicapped children.

**Recommendations:** It is recommended that:

(1) An attempt be made to study the value of the Coloured Progressive Matrices as a predictor of non-verbal skills.

(2) An attempt be made to assess the significance for test scores of the color in the Coloured Progressive Matrices.

(3) An attempt be made to assess the extent to which the Coloured Progressive Matrices may be considered a "culture-free" test.

(4) A comparison be made between the similarity of scores on the Coloured Progressive Matrices and group tests of intelligence.

85 pages. \$1.06. MicA 55-2063

# AN EVALUATION OF CERTAIN METHODS OF TEACHING MENTAL HYGIENE

(Publication No. 13,335)

Donald Alphon Leton, Ph.D.  
University of Minnesota, 1955

The purpose of this study was to evaluate certain methods of teaching mental hygiene. The following methods were under consideration: (1) Bullis, *Human Relations in the Classroom*, (2) mental-hygiene movies, (3) role playing and sociodrama, and (4) hobbies and crafts activities. While these are not comprehensive of all methodology in this field they are somewhat representative. They are comparable in that group discussion on problems of personal adjustment are elicited through the use of stimulus materials and group activities. They are also distinct from each other in that they involve different procedures, and are based on different theories of personality, therapy, and learning.

## Design of the Study

Subjects for the experiment were ninth-grade students in 1952-53 and 1953-54 from four Saint Paul high schools. The Bell Adjustment Inventory was utilized as a screening instrument. Students who received unsatisfactory ratings were sampled for the eight experimental groups and eight control groups. Thirteen students were assigned to each of the groups.

Weekly meetings were then held with members of the experimental groups for the duration of one semester during which the prescribed techniques and materials were utilized. The group leaders were counselors and teachers who had studied group techniques in an in-service education program.

The following criteria of adjustment were used to evaluate the results of the experiment:

- A. Measures of adjustment--The Bell Adjustment Inventory, the School Inventory, and the Rogers Test of Personality Adjustment.
- B. Independent behavioral data--School attendance and course grades.
- C. Internal measures of effectiveness--Social Distance Scale, participation in discussion as indicated in typescripts, and students' opinions as measured by an opinionaire.

## Experimental Hypotheses

1. There are no significant improvements resultant to courses in mental hygiene on the measures in criterion A above.
2. There are no significant differences between the experimental and control groups on behavioral data in criterion B above.
3. There is no difference between the observed distribution of students' responses on the opinion inventory and a theoretical distribution which would occur by chance.
4. There is no significant relationship between the amount of improvement in adjustment scores and the extent of participation in group discussion.
5. There is no significant difference between initial and final mean ratings on a Social Distance Scale for students in a mental health group.

The major portion of the data was analyzed by the use of analysis of variance and covariance. The internal

measures were analyzed by the use of "t" tests, Chi Square, and correlation statistics.

## Findings

1. The null hypotheses in regard to the improvement of adjustment as shown by test scores in criterion A above were generally accepted.
2. The null hypotheses in regard to school adjustment as reflected in criterion B above were generally accepted.
3. The null hypothesis in regard to the distribution of favorable opinion responses was rejected.
4. The null hypothesis in regard to the relationship between improvement in adjustment and participation in discussion was rejected.
5. The null hypothesis in regard to the social acceptance among students in the experimental group was rejected.

## Conclusions

Teachers have generally accepted the educational objectives of social and emotional adjustment for all their students. The evidence from this experiment seems to indicate that the complete accomplishment of these objectives would be extremely difficult, and perhaps continue even to be impossible in certain cases. This conclusion is made on the basis of procedures and techniques which were evaluated in this study and within the limitations of this experiment.

The writer recommends further research in this area, and additional refinement of the techniques and materials suggested for teaching mental health.

250 pages. \$3.13. MicA 55-2064

# APPRAISAL OF THE COUNSELING FACILITIES IN THE COLLEGE OF LITERATURE, SCIENCE, AND THE ARTS, UNIVERSITY OF MICHIGAN

(Publication No. 12,646)

James Davis Schorrt, Jr., Ph.D.  
University of Michigan, 1955

This investigation was set up to appraise the academic counseling facilities in the College of Literature, Science, and the Arts at the University of Michigan by presenting the students' and the counselors' opinions of these facilities. The data were collected by means of the Likert Survey Research Method. A separate survey was conducted for each group of respondents. Survey designs were developed, the objectives determined, and the populations were selected. A 4 per cent random sample of the student survey was drawn but the entire counselor population was used. The interview schedules were developed and pre-tested, the interviews were conducted, and a code was developed and applied to the interview schedules. Finally, the results were tabulated and analyzed. Some of the results of the student survey and of the counselor survey were measured for statistical differences by means of the chi-square method. A summary of the important results follows:

## The Students

1. The students in the College of Literature, Science, and the Arts see the need of an academic counseling system.



2. The students see the counselors as sources of help but not to the exclusion of other more informal sources such as friends, family, faculty, and residence hall staff.
3. The principal characteristics that students appreciate in a counselor are warmth of interest and knowledge of courses and curricula. The students' criticisms and their suggestions for improving the present counseling system as a whole are most likely to center on these two considerations.
4. The students favor a longer relationship between the student and counselor and a greater degree of accessibility of the latter.
5. An improved training program and system of selecting the counselors is recommended by the students.
6. The students are not often referred to the other counseling services of the University.
7. The students prefer a qualified or minimum use of their aptitude test scores.

#### The Counselors

1. The counselors in the College of Literature, Science, and the Arts see the need of an academic counseling system.
2. The counselors' satisfactions are: to help their counselees work out their problems, to get to know their counselees better, and to develop a greater awareness of their counselees' problems. Their dissatisfactions are: attempting to work with disinterested counselees, few contacts with counselees, and inability to solve many of the counselees' problems.
3. The counselors favor the present system and not one that would provide a longer relationship between student and counselor.
4. The counselors check student schedules to be sure that their counselees are meeting their course requirements and they frequently refer their counselees on questions of course content. They find that their counselees' problems largely fall into a common pattern.
5. About half of the counselors refer their students to other counseling services of the University, and they favor a minimum use of the aptitude tests.
6. The counselors believe that teaching experience and the right kind of personality are the prerequisites to counseling.
7. There is a feeling of satisfaction with the present counseling system in that its facilities are both adequate and satisfactory.

#### Points of Agreement and Disagreement

1. The students and the counselors see the need of an academic counseling system in the College of Literature, Science, and the Arts.
2. The students favor a longer relationship between students and counselors while the counselors do not.
3. The counselors consider themselves better informed about course content than the students believe they are.
4. Half of the counselors stated that they frequently refer their counselees to other University counseling services while the students disagree.
5. Most of the students and some counselors favor a

greater degree of availability of counselors and would like to see personal and vocational counseling added to present services.

6. Teaching experience and the right kind of personality are the prerequisites to being a successful counselor according to the counselors, but the students believe that the counselors need some specialized training and background for their work.

168 pages. \$2.10. MicA 55-2065

### THE RELATIONSHIP OF TWO EXPERIMENTAL MEASURES OF STUDENT MOTIVATION TO ACADEMIC SUCCESS IN COLLEGE

(Publication No. 12,920)

Georgiana, Djen-dzi Wei Sie, Ph.D.  
State University of Iowa, 1955

Chairman: Professor Albert N. Hieronymus

The primary purpose of this study was to evaluate and compare two instruments which, it has been hypothesized, are measures of the level of motivation of college students for college work. Both instruments, the Iowa Picture Interpretation Test and the Survey of Study Habits and Attitudes, have been the subject of considerable research. Both have shown some promise as a measure of motivational variables that are important for academic success.

Each of these instruments was used in several multiple regression equations to predict college grade-point-average. In these equations various combinations of the following predictor variables were also included: 1) rank in high school graduating class, 2) Otis Quick Scoring Mental Ability Test: Gamma C, and 3) Iowa Entrance Test Battery. In each analysis the validity of the motivational measure was tested by testing the significance of its contribution to the multiple regression. Since the Iowa Picture Interpretation Test was available in two forms, an independent evaluation was made of each. Where sufficient subjects were available, the regression analysis was computed for each sex separately as well as for the combined group. A complete table of zero-order correlations was prepared for each multiple regression analysis.

Two groups of subjects, totalling four hundred in number were used in this study. All subjects were undergraduates enrolled in elementary psychology courses at the State University of Iowa between 1953 and 1954.

From these data the following conclusions were drawn:

1. The Survey of Study Habits and Attitudes makes a significant contribution to the prediction of the academic success of students in the population studied. This contribution results from the measurement of sources of variance that are present in grade-point-average but absent from both intelligence and achievement tests. These findings are consistent with the hypothesis that the inventory represents a valid measure of motivational variables. It should be noted, however, that the importance of motivational factors in determining grade-point-average is probably greater than that

implied by the relatively small contribution made by the Survey of Study Habits and Attitudes to the multiple correlation coefficient. Much further research in this area of motivation is needed.

2. Neither the ten-item nor the twenty-four-item Iowa Picture Interpretation Test makes a significant contribution to the prediction of academic success of this population. Neither test was found to bear a significant relationship with any of the following variables: grade-point-average; Survey of Study Habits and Attitudes; Otis Mental Ability Test, Gamma C; and Iowa Entrance Test Battery. The lack of any significant relationships with these variables was interpreted as evidence of low reliability in the Iowa Picture Interpretation Test.
3. For this population, the best single predictor of college success is high school rank. The next best single predictor is entrance test battery composite score. When these two measures are used in conjunction in a multiple regression equation, both make significant contributions to the prediction.

104 pages. \$1.30. MicA 55-2066

A COMPARATIVE STUDY  
OF ACHIEVEMENT TEST SCORES  
OF FRATERNAL AND IDENTICAL  
TWINS AND SIBLINGS

(Publication No. 12,923)

Bill Carl Franklin Snider, Ph.D.  
State University of Iowa, 1955

Chairman: Professor Paul Blommers

This study is basically concerned with the investigation of relationships between various groups of identical and fraternal twin pairs and sibling pairs for selected measures of educational or school achievement. The interest in this study is primarily concentrated in the determination of the facts regarding such relationships. Since these relationships have been investigated in the past largely by students of the nature-nurture problem, some attention will be given to this problem in presenting the results. Criterion measures used in this study were obtained from the Iowa Tests of Basic Skills. These measures were reading comprehension, vocabulary, work-study skills, language skills, and arithmetic skills, and also a composite score which consisted of the sum of the above measures excluding the vocabulary test score.

A prospective twin list was compiled by checking through the summary sheets of school reports for the 1954 Iowa Tests of Basic Skills which lists alphabetically the names of each child in a given grade and school. These reports also show the child's age by year and month.

A questionnaire was mailed to the principal of the school attended by each pair of children thus identified asking if they were twins, and if so, whether they were identical or fraternal. He was also asked to indicate the names and grades of their siblings and to forward a questionnaire to the parents involved if the children were twins.

The information requested on the parent's questionnaire was: (1) the classification of the twin pair as

identical or not identical; (2) the basis for this classification (doctor's statement, identity of appearance, or other reasons); and (3) the names and present grade placements of brothers and sisters currently in school.

From the results of the two questionnaires, 582 twin pairs were identified and studied. They were placed in identical or fraternal twin pair groups, according to information obtained from the questionnaires. If the classification was questionable, they were placed in an "other" group. Of the 582 twin pairs: 152 were classified as identical, 363 as fraternal, and 67 twin pairs were placed in the "other" group.

Within grade intraclass correlation coefficients were computed for various identical, fraternal, and sibling groups. The findings are summarized in the following table.

Within Grade Intraclass Correlations for Various  
Types of Twin and Sibling Pairs in Selected  
Areas of Educational Achievement

Group	Read- ing	Vocab- ulary	Work Study	Lan- guage	Arith- metic	Compo- site
Identical	.740	.809	.836	.835	.772	.866
Boys						
Identical	.743	.766	.664	.711	.694	.791
Girls						
All Identical	.746	.786	.744	.782	.729	.826
Fraternal	.526	.470	.620	.513	.580	.633
Boys						
Fraternal	.513	.576	.671	.638	.711	.624
Girls						
Fraternal	.518	.529	.650	.587	.676	.628
Like-Sex						
Fraternal	.294	.467	.342	.285	.422	.377
Mixed Sex						
Siblings	.226	.261	.203	.207	.214	.272

By statistical comparison of these within grade intraclass correlation coefficients certain conclusions regarding the nature-nurture problem may be drawn as follows:

1. The within grade intraclass correlation coefficients of various identical twin groups were in general significantly higher than those for corresponding fraternal twin groupings in all educational achievement areas studied with the possible exception of arithmetic skills.

2. The within grade intraclass correlation coefficients of boy twin pairs did not differ significantly from those for girl twin pairs for either the identical or fraternal types in all educational achievement areas studied.

3. The within grade intraclass correlation coefficients of fraternal like-sex twin pairs were in general significantly higher than those for fraternal mixed sex (boy-girl) twin pairs in all educational achievement areas studied except vocabulary.

4. The within grade intraclass correlation coefficients for any identical or fraternal twin group were significantly higher than those for sibling pairs in all educational achievement areas studied.

5. The within grade intraclass correlation coefficients for any twin or sibling pairs at the third to fourth grade level did not differ significantly from those for the



corresponding twin or sibling pairs at the seventh to eighth grade level in any educational achievement area studied. 176 pages. \$2.20. MicA 55-2067

# DIFFERENTIAL RATES OF MENTAL DEVELOPMENT IN CHILDREN

(Publication No. 12,666)

Max Martin Weinlander, Ph.D.  
University of Michigan, 1955

The purpose of this longitudinal study is to establish separate Top, Mental, and Basal Age rate and rate variability concepts of mental development in children and to determine their respective mean and dispersion difference by sex. To obtain these objectives, two major hypotheses — each followed by two minor hypotheses — were tested, specifically: (I) There are significant differences among the means in mental development rates for Top, Mental, and Basal Age; (I-A) The mean Top, Mental, or Basal Age rates reveal no significant sex difference; (I-B) The dispersions of Top, Mental, and Basal Age rates reveal no significant sex difference; (II) There are significant differences among the means of rate variability in mental development for Top, Mental, and Basal Age; (II-A) The mean rate variability of Top, Mental, or Basal Ages reveals no significant sex difference; (II-B) The dispersions of rate variability in Top, Mental, or Basal Ages reveal no significant sex difference.

This is a developmental study. The longitudinal data of the 140 children studied were obtained from the Child Development Laboratory, established in 1929, at the University of Michigan Elementary School. Every child who had received a minimum of six mental tests (each in successive chronological years) was included. Through 1941, the Kuhlman-Binet Test was employed; since then the 1937 Stanford Binet scale has been used. From these two tests, separate test sample series — referred to as Binet, Kuhlman, and Mixed — were obtained in order to have three criteria of measurement for testing the six hypotheses of this investigation. For each longitudinal record, Top, Mental, and Basal Age rates of mental development were derived by the method of the least squares. A separate formula was used to secure the rate variability. An analysis of variance tested the two major hypotheses, and t-tests determined significant differences among the various rate and rate variability pairs. Also, the t-test and where applicable, the variance ratio, and the Welch Test were applied to decide the significance of sex differences for the mean or the dispersion in the four minor hypotheses.

The results of testing Hypotheses I and II which postulated differences revealed significant differences. The results for testing Hypotheses I-A, I-B, II-A, and II-B, which postulated no differences, revealed significant differences only for Hypothesis II-A.

Two general conclusions can be drawn from the study: (1) The Top, Mental, and Basal Age mean rate or mean rate variability of mental development show significant differences from each other at the 1 per cent level, except between the means of Top and Basal Age rate variability; (2) The mean and dispersion of rate or rate variability in mental development reveal no significant sex differences,

except between the means of Basal Age rate variability. In Hypothesis II-A, the mean rate variability for boys was found to be greater than for girls in Basal Age mental development. This significant sex difference was ascertained at the 5 per cent level in the Binet and Kuhlman test sample series, and at the 1 per cent level in the Mixed test sample series.

110 pages. \$1.38. MicA 55-2068

## EDUCATION, TEACHER TRAINING

### A COMPARATIVE ANALYSIS OF THE ON-CAMPUS AND OFF-CAMPUS STUDENT TEACHING PROGRAMS IN SECONDARY SCHOOLS AT MIAMI UNIVERSITY

(Publication No. 13,210)

William A. Bennie, Ed.D.  
Indiana University, 1955

Supervisor: H. T. Batchelder

During the school year, 1953-1954, Miami University operated two programs of student teaching, each requiring a full semester of participation. One program consisted of the conventional limited-assignment pattern of one hour per day in the campus laboratory school while carrying additional campus classes. The other program was a full-time teaching pattern in which students taught in public schools, devoting full time to teaching. With the exception of a weekly seminar, these students carried no university classes.

The purposes of this investigation were: to determine the objectives of student teaching at Miami University, to ascertain the extent of student teacher participation in activities contributing to the attainment of these objectives, to compare the attainment of the objectives by on-campus and off-campus student teachers, and to derive conclusions which could serve as the basis for the improvement of the student teaching program.

The first phase of the investigation involved the formulation of valid objectives of the student teaching program by all participants in the program and the determination of learning activities contributing to the attainment of these objectives. Participating in this phase of the study were 44 off-campus student teachers, 43 on-campus student teachers, 51 supervising teachers, and 53 faculty members of the School of Education of Miami University. The second phase consisted of ascertaining the extent of participation of the student teachers in the activities and the value of that participation through the use of personal interviews at each six-week interval. The final phase of the study involved the appraisal of the degree of attainment of the objectives of student teaching by both student teachers and supervising teachers.

The following specific conclusions are based on the findings of this investigation:

1. Student teachers, supervising teachers, and the faculty of the School of Education, Miami University, were in general agreement concerning the objectives of student teaching.

2. Student teachers and supervising teachers were in general agreement concerning the value of activities contributing to the attainment of the objectives of student teaching.

3. Activities concerned with actual classroom instruction and total school relationships were considered of most value and those concerned with routine affairs were considered of least value.

4. During each six-week interval in the semester, off-campus student teachers participated to a greater extent in teaching activities than did on-campus student teachers.

5. Both groups of student teachers participated most in activities related to the actual classroom situation and least in activities concerned with school-community relationships.

6. Off-campus student teachers participated much more than on-campus student teachers in activities concerned with the total school environment.

7. Off-campus student teachers had much more adequate participation in the total range of teaching activities than did the on-campus student teachers.

8. Off-campus student teachers had fewer limiting factors prohibiting participation in learning activities than did the on-campus student teachers.

9. Some objectives of student teaching were reached earlier than others.

10. Off-campus student teachers attained more objectives of student teaching in a shorter period of time than did the on-campus student teachers.

11. Supervising teachers and student teachers had many suggestions to offer concerning the improvement of the student teaching program.

It is therefore generally concluded that, since full-time student teaching as reflected in the off-campus program provides opportunity for more student teacher participation in learning activities, involves more adequate participation in these activities, and results in greater and earlier attainment of the objectives of student teaching, this program of student teaching at Miami University appears to be superior to the existing on-campus program.

334 pages. \$4.18. MicA 55-2069

# THE REFINEMENT AND PARTIAL VALIDATION OF A PROFESSIONAL BELIEFS INVENTORY FOR PROSPECTIVE TEACHERS

(Publication No. 13,211)

Alpha Edgar Bernard, Ed.D.  
Indiana University, 1955

Chairman: Robert W. Richey

## Problem

The purpose of this investigation was to construct, refine, and partially validate a professional beliefs inventory for assisting prospective teachers in identifying their major professional beliefs. Related aspects were to study the nature of belief, the interrelationship between beliefs, values, and attitudes, and the procedural bases for inventorying beliefs; to prepare a professional beliefs inventory; to refine the inventory so it would provide for clarity of expression and discriminate among various college

groups of prospective teachers; to devise a method of scoring the inventory which would be helpful as a basis for self-study and guidance; and to determine the reliability and the validity of the inventory.

## Procedure

The following procedures were used to conform to prior practices in the construction of belief and attitude inventories which seemed to have merit:

1. An outline was constructed to facilitate the process of selecting statements with a minimum of duplication.

2. A comprehensive survey of the total teaching-learning process was made to select concepts worthy of studying.

3. The select concepts were formulated into statements of belief conforming to established criteria.

4. A series of pilot studies were conducted for the purpose of clarifying statements and selecting statements that represented misconceptions in the minds of prospective teachers. Statements that discriminated between college groups were retained for the first experimental form of the inventory.

5. A method of scoring the instrument was devised to yield six types of scores: an agree score, a caution score, a beyond jury score, an uncertain score, a disagree score, and a strongly disagree score. The six types of scores were based on the mean response of a jury of 16 educational specialists.

6. The instrument was administered to 440 prospective teachers representing various college groups to determine the discriminatory power of the statements of the reliability of the instrument.

7. Suggestions were solicited to determine adequacy of coverage of concepts relative to the total teaching-learning process.

## Conclusions

The following conclusions are based on this study and are applicable solely to the subjects of the study:

1. There is much disagreement among freshman and sophomore class prospective teachers as to the nature of their professional beliefs. There seems to be a tendency to accept beliefs with little or no effort to understand the implications of the acceptance of false beliefs or of the rejection of true beliefs.

2. A prospective teacher's professional beliefs are strengthened and matured as a result of increased professional training and professional laboratory experiences.

3. There seems to be an increased tendency toward dogmatism or a polarization or response as prospective teachers complete additional professional training and/or participate in professional laboratory experiences.

4. The professed beliefs toward child growth and development and toward the function of the school in a democratic society of students who complete the initial psychology course are significantly more consistent with those of educators toward the same areas than are the professed beliefs of students without previous educational courses.

5. Beliefs toward teacher behavior and teaching competencies are least affected by the initial psychology course.

6. The professional beliefs of the student teachers are significantly more consistent with those of the educational specialists than are the professional beliefs of any other college group studied.



7. There seems to be little difference in the extent to which the various college groups are cautious.

8. The coefficient of correlation indicates that the professional beliefs of freshman and sophomore class student teachers are relatively stable.

9. The instrument as developed seems to reveal issues and concepts which need to be stressed in the professional preparation of prospective teachers.

357 pages. \$4.46. Mic 55-268

**A STUDY OF THE RELATIVE EFFECTIVENESS  
OF FOUR DISTRIBUTIONS  
OF WEEKLY INSTRUCTIONAL TIME  
IN COLLEGE FRESHMAN MATHEMATICS**

(Publication No. 12,700)

Kenneth Eugene Gabel, Ph.D.  
Syracuse University, 1955

Patterns in the distribution of college class hours within the school week have developed with a notable lack of research either to commend or to condemn them. The question arises as to whether less commonly practiced scheduling plans are comparable to, or superior to, those in general usage.

In the study described below an attempt was made to test four distinct weekly distributions of classroom time which could be put into practice in most college programs. Each of the four schedules tested called for 150 minutes of class time per week. The schedules differed in that one called for a single weekly class session of 150 minutes, one called for two seventy-five minute sessions, one called for three fifty-minute sessions, and one called for five thirty-minute sessions per week.

The experimental course was one in general freshman mathematics of three semester hours credit. It was conducted for one semester and emphasized logic, basic number concepts, analysis of arithmetic processes, and problem analysis. The experimental subjects were ninety-two entering freshmen in a New York State Teachers College. From this group four class sections were formed ranging from twenty-one to twenty-five students per section.

Excepting the variable under study, an attempt was made to control all variables relevant to student achievement in the experimental course. The three methods of control employed were: (a) control through design, (b) control through selection of subjects, and (c) statistical control.

Control of the teacher variable was largely dependent on experimental design. The same teacher, course syllabus, textbook, classroom, teaching notes, assignments, and other aids to teaching were used in all four groups.

Control of variables which did not readily lend themselves to objective measurement for statistical control or control through design, was attempted through the selection of the experimental subjects. At the time of the experiment the names of entering elementary education freshmen were listed alphabetically. Blocks of this list were arbitrarily taken to form the experimental sections. It was assumed that the variables which could affect achievement in the experimental course had no correlation with the alphabetical order of the subjects' names.

Eight pre-experimental tests were employed to provide an objective description of each subject in the areas of reading, learning ability, critical thinking, achievement in mathematics and motivation. At the close of the experimental period four objective tests were used to measure the subjects in the areas of critical thinking and achievement in mathematics. Through analysis of covariance the results of the post-experimental tests were analyzed to determine whether the differences among sections were statistically significant.

The conclusions of this study may be summarized as follows:

1. No significant differences in affective powers on learning were found among the four distributions of weekly instructional time under investigation.
2. The schedule of two weekly class meetings of seventy-five minutes each ranked first in student popularity.
3. The single weekly session of 150 minutes ranked lowest in student popularity.
4. The schedule of two seventy-five minute weekly sessions seemed to the experimental teacher to offer the optimum in a compromise of the favorable and unfavorable qualities found among the four schedules.
5. The experimental instructor found unfavorable qualities greatest in the schedule of five thirty-minute sessions per week.
6. The instructor found that his personal knowledge of the individual student tended to increase with an increase in the number of weekly class sessions.
7. The instructor found that the difficulty of organization of topical material into teachable form lessened as the length of the class session was increased.

270 pages. \$3.38. MicA 55-2070

**A STUDY OF AN INTERCHANGE OF  
TEACHER PROGRAM ON THE LOCAL, NATIONAL,  
AND INTERNATIONAL LEVEL, WITH EMPHASIS  
ON THE SEATTLE, WASHINGTON,  
PUBLIC SCHOOL EXCHANGE TEACHER PROGRAM**

(Publication No. 12,984)

William Ralph Gilbert, Ph.D.  
University of Washington, 1955

Supervisor: Dr. Curtis T. Williams

**Purpose**

The purpose for this study was to determine the values of an exchange of teacher program and to determine the benefits accrued by individual teachers from having had exchange teaching opportunities both on a domestic and international level.

**Method**

The normative survey method of research was employed in this study and the data were collected by questionnaires.

Eighty-one of the one hundred and one teachers who had exchanged from the Seattle, Washington, Public Schools were dispatched questionnaires designed to elicit data concerning the administration and derived values of the exchange program of Seattle. From this total, seventy-seven responded.

Questionnaires were sent to the superintendents of six other city public school systems in the United States. This survey instrument was constructed to obtain information concerning the administrative policies governing their exchange programs. All six of these questionnaires were returned. These superintendents were also asked to select five teachers in each of their districts, who had been on exchange, to respond to the identical form sent to the Seattle teachers. All thirty of these teachers from the six cities returned their completed questionnaires.

Fifty teachers who had exchanged to the United States from foreign nations, and fifty American teachers who had exchanged abroad, were dispatched questionnaires to elicit data concerning their exchange experiences. Forty-nine of the former, and thirty-six of the latter, returned their completed forms.

### Conclusions

It was observed that:

1. Public school systems in the United States could incorporate some of the points mentioned, as they are applicable to their own situation, to strengthen their existing exchange program to obtain the most desirable results from the interchange of persons. School systems desiring to establish an exchange program could use these data as a starting point in the establishment of their program.
2. There are many benefits to be obtained from exchange teaching in these areas: academic, professional, and social values. A majority of the respondents asserted that these values were ever-present, real, and beneficial.
3. School administrators of systems who sponsor an exchange program gain values. Faculty members enhance their teaching ability from having exchanged, indirectly benefiting the school administration because of the enriching experiences provided pupils by a teacher who has had an exchange opportunity.
4. Foreign teachers who exchanged to the United States found the program to be an educationally sound enterprise. Most of the respondents affirmed that they gained professionally, academically, and socially from having taught in the United States as an exchange teacher. Most stated they gained insight into life in the United States, information they used upon returning home to combat the erroneous impressions that some of their countrymen had formulated about the way Americans live their daily lives.
5. The study could be utilized by American teachers anticipating an overseas exchange assignment to acquaint them with the following: how they are oriented upon arrival and how they are integrated into the foreign community; an explanation of the curricular and extra-curricular responsibilities as attested to by respondents who exchanged to several foreign nations.
6. Suggestions were offered to administrators of the exchange program, by both foreign and American respondents, whereby the program could be more effectively administered.

The writer feels that an interchange of teacher program is one of the most effective ways of promoting the greatest fellowship program in the world's history. This program can, and has, proved that misconceptions and misunderstandings among peoples and nations will be legendary anecdotes of past generations because of the fact that face-to-face contacts have been accomplished between average Americans and their counterparts overseas.

350 pages. \$4.38. Mic 55-269

### CERTAIN DEVELOPMENTS AND TRENDS IN INDUSTRIAL ARTS TEACHER EDUCATION

(Publication No. 12,777)

Edwin L. Kurth, Ed.D.  
The University of Florida, 1955

The purpose of this study was to survey education institutions which include industrial arts teacher preparation in their programs to determine the teacher recruitment practices used and rated as most effective; the undergraduate preparation given industrial arts teachers in those broad non-specialized areas of knowledge known as general education; the practices and methods considered most effective in present day industrial arts teacher preparation; and the trends educators feel will influence industrial arts teacher preparation in the future.

Data secured by questionnaire from 120, or 60 per cent of the 198 institutions preparing industrial arts teachers and granting the baccalaureate degree, were compiled and interpreted. Developments resulting in effective procedures now used and trends that may effect future industrial arts teacher education are identified.

### Conclusions

The following are the more significant conclusions drawn from the data secured for this study.

1. Many teacher recruitment practices now used by teacher education institutions are not considered to be highly effective.
2. The recruitment plans considered to be the most effective are not used by many teacher education institutions.
3. Recruitment practices involving personal contact between college or industrial arts personnel and prospective teachers are most effective in recruiting industrial arts teachers.
4. Understandings and requirements of general education vary widely.
5. Industrial arts has a place as required or elective general education.
6. General education subjects recommended for industrial arts majors and other teacher candidates are similar and include English, Social Science, Mathematics and Physical Science.
7. Present enrolments in industrial arts teacher preparation will not supply future demands for teachers.
8. Industrial arts teachers need to be prepared to teach in both unit shops and general shops although general shops are more prevalent in high schools than unit shops.



9. Most teacher preparation programs utilize community resources to provide additional laboratory experiences with children and youth.
10. More full time student teaching is being required for teacher candidates.
11. A special methods course prior to or concurrent with student teaching; assisting the sponsor teacher in many of his duties plus the preparation and presentation of lessons in several areas are most prevalent experiences provided as a part of student teaching.
12. Group dynamics and problem solving on an individual or group basis are modern theories of teaching and learning that can be further utilized and applied in industrial arts. 250 pages. \$3.13. MicA 55-2071

**A STUDY OF THE RELATIONSHIPS BETWEEN  
ATTITUDES, INTELLIGENCE, AND ACHIEVEMENT  
OF UNIVERSITY OF MINNESOTA MAJORS  
IN EDUCATION GROUPED BY  
MAJOR AREA OF SPECIALIZATION**

(Publication No. 13,342)

Arvid Neil Pearson, Ph.D.  
University of Minnesota, 1955

**Purpose.** The purpose of the investigation was to study the comparative performance of undergraduate students in education, grouped by major areas of specialization, on certain of the commonly used indices of intelligence, attitudes, and achievement. A second phase was concerned with determining the extent to which teacher attitudes correlate with intelligence and achievement.

**Method.** Data were gathered on the performance of 306 junior and senior students majoring in education on the Minnesota Teacher Attitude Inventory, the American Council on Education Psychological Examination, the Cooperative English Test, high school percentile rank, sixth-quarter honor point ratio, and ninth-quarter honor point ratio. The sample was grouped into the following areas of specialization: Agricultural Education, Elementary Education, Home Economics Education, Industrial Education, Physical Education, and Other Secondary Education. The hypotheses tested were that no significant difference exists between the mean scores obtained on each of the indices by all possible combinations of pairs of student groupings. Performance on the index of teacher attitudes was correlated with intelligence and achievement respectively.

**Findings.** Comparisons of mean scores on the Minnesota Teacher Attitude Inventory revealed:

1. Elementary Education majors scored significantly higher than Industrial, Agricultural, and Other Secondary Education majors.
2. Home Economics Education majors scored significantly higher than Industrial, and Agricultural Education majors.
3. The differences between other combinations of pairs of specialization groupings were not significant.

Comparisons of mean scores on the American Council on Education Psychological Examination revealed:

1. Home Economics Education majors scored signifi-

cantly higher than Industrial, Physical, and Agricultural Education majors.

2. Other Secondary Education majors scored significantly higher than Industrial Education majors.
3. The differences between other combinations of pairs of specialization groupings were not significant at the one per cent level.

Comparisons of mean scores on the Cooperative English Test revealed:

1. Home Economics Education majors scored significantly higher than Industrial, Agricultural, Physical, and Elementary Education majors.
2. Other Secondary Education and Elementary Education majors scored significantly higher than Industrial, and Agricultural Education majors.
3. Physical Education majors scored significantly higher than Industrial Education majors.
4. The differences between other combinations of pairs of specialization groupings were not significant at the one per cent level.

Comparisons of mean high school percentile ranks revealed:

1. Home Economics Education majors ranked significantly higher than Industrial, Physical, Agricultural, and Other Secondary Education majors.
2. Elementary, Other Secondary, Agricultural, and Physical Education majors all ranked significantly higher than Industrial Education majors.

Comparisons of mean honor point ratios at the beginning of the sixth quarter in college:

1. Other Secondary Education and Home Economics Education majors earned significantly higher sixth-quarter honor point ratios than Industrial, and Agricultural Education majors.
2. Elementary Education majors obtained significantly higher sixth-quarter honor point ratios than Industrial Education majors.
3. The differences between other combinations of pairs of specialization groupings were not significant.

Comparisons of mean honor point ratios at the beginning of the ninth-quarter in college:

1. Elementary Education and Other Secondary Education majors obtained significantly higher ninth-quarter honor point ratios than Industrial Education majors.
2. The differences between other combinations of pairs of specialization groupings were not significant.

The following coefficients of correlation were obtained when attitudes were correlated with intelligence and achievement indices respectively: (MTAI-ACE,  $r=.16$ ), (MTAI-Coop. Eng.,  $r=.21$ ), (MTAI-HSPR,  $r=.21$ ) and (MTAI-9th Quar. HPR,  $r=.24$ ).

**General Conclusions.** Statistically significant differences do exist between undergraduate students in certain areas of specialization in education. Generally, Home Economics Education and Elementary Education majors scored significantly higher than Industrial Education majors and on some of the indices significantly higher than Agricultural Education and Physical Education majors. A low positive correlation was found between attitudes and each of the indices of intelligence and achievement.

122 pages. \$1.53. MicA 55-2072

**AN EVALUATION OF THE FLORIDA  
CLASSROOM TEACHERS' WORK CONFERENCE  
WITH IMPLICATIONS FOR IN-SERVICE  
TEACHER EDUCATION**

(Publication No. 12,780)

Virginio Louis Piucci, Ed.D.  
The University of Florida, 1955

**Problem and procedures.** — An evaluative study was undertaken to assess the functioning of the Florida Classroom Teachers' Work Conference held on the campus of the University of Florida, Gainesville, over a six year period (1948-1954). The problem was to determine whether the purposes of the conference were fulfilled: (1) to contribute to the professional improvement of the classroom teacher, (2) to stimulate participation in the formulation of educational policies at both state and local levels, and (3) to provide opportunity and guidance in learning to work together.

An evaluative questionnaire designed to elicit judgments concerning the effectiveness of various aspects of the Work Conference was submitted to a representative sample of participants attending each year. In addition, personal interviews were held with a representative sample of faculty members of the College of Education, University of Florida, who had served in the Work Conference as leaders, resource persons, or consultants.

**Findings.** — It was found that in the judgment of participants the Florida Classroom Teachers' Work Conference was achieving the purpose for which it was designed. The experiences gained at the conference contributed significantly to the professional improvement of teachers by: (1) increasing the number of participants' affiliations in local, county, state, and national education associations, (2) improving teachers' competencies in working with children, in utilizing human and community resources, and in contributing to teacher participation in school-community relations, (3) improving teachers' competencies in selecting and using materials, (4) providing opportunities for participants to assume leadership roles at the conference, (5) increasing participants' assumption of leadership roles in professional organizations, and (6) improving teachers' competencies in the use of the group approach as a way of working with children.

It was also found that the experiences gained by the participants significantly influenced participation in the development of educational views and policies at both state and local levels by stimulating participation in: (1) local, county, and state educational associations, (2) civic groups, parent-teacher groups, school facilities, and lay community groups, and (3) the use of letter-writing and personal contacts in behalf of professional problems.

**Implications.** — Patterns of response provided a basis for the formulation of a set of operational principles for conferences of this type. They were:

1. In-service teacher education programs should be anchored in the specific professional needs and problems of participants in order to improve their professional competence in dealing with local problems affecting public education.

2. A program of in-service teacher education should be democratically and cooperatively planned to release the creative potential of each individual.

3. The development of leadership in the program should be the function of the entire group of participants. This would broaden the base of constructive participation and allow opportunities for the continued growth of the teaching profession.

4. The "Workshop Way of Working" should be the central experience in this type of program in order to encourage freedom of expression, develop initiative, and provide opportunities for working together.

5. Participants in the program should represent a wide distribution geographically in order to facilitate communication of ideas and experiences.

6. Criteria for selection should be developed to insure heterogeneity in terms of age, teaching position, educational background, and experience for the purpose of interstimulation.

7. An evaluation of workshop-type programs should be an integral part of the experience. Hence, participants would be involved in the definition of the problem, formulation of design, and in interpretation of results.

249 pages. \$3.11. MicA 55-2073

**A PROPOSED AUDIO-VISUAL PROGRAM  
FOR THE PHILIPPINE NORMAL COLLEGE**

(Publication No. 13,225)

Sofia Lozano Prudenciado, Ed.D.  
Indiana University, 1955

Chairman: L. C. Larson

**The Problem**

It was the main purpose of this study to recommend a feasible and promising audio-visual program for the Philippine Normal College, based upon the audio-visual resources and needs of the College. The subproblems were: (1) to ascertain the characteristics of a desirable audio-visual program in the light of available literature and research, (2) to analyze the factors that influence the audio-visual program of the Philippine Normal College, (3) to appraise the status of audio-visual resources available to the Philippine Normal College, and (4) to recommend certain considerations for the improvement of the present audio-visual program.

**Procedure and sources of data.** The method used in this study was basically that of analysis, synthesis, and reasoning based on the resources examined. First, literature and research in the field of audio-visual education were studied to ascertain the characteristics of a desirable audio-visual program. Secondly, factors influencing the audio-visual program of the Philippine Normal College, based on answers to questionnaires and annual reports of the president of the college, were analyzed. Thirdly, the information and statistics describing the status of the audio-visual resources available to the institution were appraised. Lastly, a feasible program was recommended.

**Conclusions**

On the basis of the findings, the following conclusions were formulated concerning an audio-visual program for the Philippine Normal College: (1) although some students



and instructors in the College are aware of audio-visual education, many do not recognize its contribution to the educational process; (2) the administrative position of the Audio-Visual Department in the over-all College administrative organization is satisfactory; (3) there is need for an audio-visual center with adequate budget, facilities, equipment, materials, and personnel; and (4) the teacher education program in audio-visual education on the under-graduate level needs expanding and that on the graduate level needs developing.

#### Recommendations

Recommendations which seem to be justified on the basis of the data are: (1) the Philippine Normal College should have a well organized and centrally located audio-visual department performing the functions of a college audio-visual center; (2) to accomplish the foregoing recommendation, the Philippine Normal College should maintain a library of audio-visual materials to serve all educational levels and areas, should set up a definite and adequate audio-visual budget, and should have an audio-visual staff adequate to meet the instructional and service needs of the institution; (3) a program should be undertaken to publicize the values and benefits derived from the use of audio-visual materials; (4) a program of pre-service experiences in utilization, selection, evaluation, and preparation of audio-visual materials for instructional purposes should be developed; (5) an in-service program should be developed and expanded to include not only teachers in the field but also the College's own instructors; and (6) continuing evaluation of the effectiveness of the audio-visual program and research should be encouraged and fostered.

380 pages. \$4.75. MicA 55-2074

#### ANALYSIS OF THE PROBLEMS OF THE OFF-CAMPUS SUPERVISORS OF STUDENT TEACHERS

(Publication No. 12,916)

Helen Louise Richards, Ph.D.  
State University of Iowa, 1955

Chairman: Professor Herbert F. Spitzer

The purpose of this study was fourfold: (1) to analyze the problems of off-campus supervising teachers encountered in their work with student teachers; (2) to determine the types of assistance institutions provided for these teachers; (3) to find out how satisfactory the provided help has been in meeting the needs of supervising teachers; and (4) to determine what types of assistance these teachers would like to have provided by institutions and school principals.

A three-part questionnaire was constructed. Part I, which was made up of twelve major problem areas with each subdivided into several problem situations, was designed to obtain data concerning the problems encountered by off-campus supervising teachers in their work with student teachers. The five-point scale ranging from "no difficulty to serious difficulty" was a guide for rating the

difficulty level of each of the fifty activities or problem situations. Part II-A consisted of twenty items which yielded data on: (1) the types of assistance provided; (2) the satisfactory nature of the help; and (3) supervising teachers' desires for certain types of assistance. The last part of the questionnaire presented an account of a student teacher's first day's experiences in the off-campus teaching situation. Questions at the end of this section of the questionnaire furnished data regarding the opinions of supervising teachers as to the supervisory value of such materials.

Twenty-six institutions which were known to have off-campus student teaching programs, and which represented the major geographical areas of the country were asked to co-operate with the study. Eighteen of the institutions contacted replied, fourteen, or 62 per cent, of which agreed. These institutions sent the names and addresses of elementary teachers who had recently served as supervising teachers in their off-campus student teaching programs. (Supervising teachers at the junior high school level were included as "elementary grades" are not rigidly defined in various states and/or school systems.)

Data were obtained through the use of the three-part questionnaires which were sent to 400 off-campus supervising teachers. Of the questionnaires returned 270, or 67.5 per cent, were usable. These were fairly representative of the various sections of the country and the different grades taught in the elementary school.

An item analysis procedure of tabulation yielded a score for the level of difficulty for each item. The scores were weighted and the means for the difficulty level of each item were determined. The mean, median, and standard deviation of the difficulty level of all the fifty items were ascertained, and the median difficulty rating for all the items was used as the point above and below which the item was said to be of "much difficulty" or of "little or no difficulty." The test for independent measures (null hypothesis) was employed to test the significance of the difference between the mean difficulty ratings of the items by teachers grouped according to years of supervising experience.

The findings seem to justify the following conclusions:

1. The problem areas and the specific activities with which supervising teachers encountered much difficulty in working with student teachers were: all activities regarding discipline; finding ample time to supervise extraclass activities; assisting student teachers with all types of motivational activities; and helping student teachers to provide for individual differences. In order of decreasing difficulty, similar statements may be made in respect to certain activities in planning, methods of teaching, conferences, materials of instruction, and evaluation.

Academic status did not appear to affect the supervising teachers' ratings of the difficulty of specific problem situation.

Teachers with one year of supervising experience generally rated problem situations as less difficult than did the more experienced ones. There was, however, a noticeable decrease in the difficulty ratings of problems with corresponding increase in years of supervising experience for teachers with two-to-ten years of experience, and an increase for teachers with eleven or more years of supervising experience.

2. Regarding the types of assistance provided, desired,

and the satisfactory nature of such help, institutions and principals provided to a satisfactory degree most of the types of help for which supervising teachers expressed much desire. However, some much desired help such as, practical procedures illustrating off-campus student-teaching situations, special workshops, current materials concerning student teaching, conferences with school administrators, and financial assistance were not provided for the majority of these teachers.

Only a few types of assistance provided were little desired and unsatisfactory. These included: summer courses, and county-instructional supervisors' and school principals' assistance with observation of the students' teaching and participation in the conferences.

Supervising teachers with one year of experience (free response statements) were unaware of a number of problems existing in their work with student teachers, indicated more frequently than did more experienced supervising teachers that institutions failed to provide adequate and sufficient assistance, but they were not especially desirous of having the principals and county-instructional supervisors assist them with student teachers.

3. Supervising teachers desired to have Illustrative Student-Teaching Procedures distributed in the form of special bulletins, or included in student-teaching handbooks. 248 pages. \$3.10. MicA 55-2075

#### PROBLEMS OF THE BEGINNING INDUSTRIAL ARTS TEACHER

(Publication No. 12,783)

Richard Walter Shackelford, Ed.D.  
The University of Florida, 1955

The purpose of this study was to locate the difficulties of beginning industrial arts teacher in the state of Florida. Through personal interviews the study attempted to delve deeper into causes and remedies for teachers' problems. By intensive study of new industrial arts teachers' problems, it was hoped the loss of teachers could be reduced, and the efficiency of teachers now in service could be increased to a higher level.

Data secured from nineteen new industrial arts teachers, sixteen principals, five department heads of colleges and universities in the state offering a major in industrial arts, and four supervisors of industrial arts in the public schools within the state were compiled and analyzed. The problems received from the forty-four interviewees were categorized into ten areas as follows: instruction, teacher-pupil relations, philosophy and procedures, administration and teachers, personal relations, tools and equipment, supplies and materials, physical facilities, community relations, and housing.

The problems were presented according to areas in which they were categorized, and the main problems were discussed with observations made by the writer incorporated in the study.

Major conclusions were:

1. Sufficient effective course work in industrial arts methods of teaching was not offered during college preparation of teachers, or the new teachers did not concentrate sufficiently on this phase of work.

2. The colleges should have given a more practical approach toward teacher-pupil relations, while teachers should have reduced the number of rules promulgated for pupils but enforced the rules that were instituted.

3. Attitudes of teachers toward shop maintenance needed to be improved, while more intensive college training in skills relative to shop tools and maintenance should be initiated.

4. The college intern program was perhaps the most effective means for new industrial arts teachers to make the transition from the theoretical to the more practical side of teaching.

5. New teachers should be made aware of the value of participation in civic and professional relationships to the industrial arts program.

6. Inadequate budgets were deterrents to well-rounded industrial arts programs.

171 pages. \$2.14. MicA 55-2076

#### AN ANALYSIS OF THE TWELVE-HOUR PROGRAM OF ON-CAMPUS STUDENT TEACHING IN THE SECONDARY SCHOOL AT SOUTHERN ILLINOIS UNIVERSITY

(Publication No. 13,235)

Clarence William Stephens, Ed.D.  
Indiana University, 1955

Major Adviser: Howard T. Batchelder

The purpose of this investigation was to analyze various aspects of the 12-hour program of on-campus student teaching at Southern Illinois University and to derive conclusions as warranted by the findings which might serve as a basis for improving the program.

Questionnaires, including report forms and check lists, were collected periodically from student teachers and supervising teachers. The following types of data were collected: (1) agreement, disagreement, or agreement with reservation to 26 objectives of student teaching and relative attainment of these objectives; (2) problems and difficulties encountered by student teachers; (3) activities participated in by student teachers and their relative value; (4) number of times and minutes or hours of participation in each of the activities; and (5) suggestions for improving the program.

The findings indicated that student teachers and supervising teachers were in general agreement as to the objectives of the program; a wide variety of difficulties were encountered by student teachers; a majority of the difficulties were of an instructional nature; in general, student teachers in all subject areas encountered the same types of difficulties even though their number decreased during each period of student teaching; many difficulties remained unsolved at the end of student teaching; student teachers in all subject areas participated in a wide variety of activities, and, with the exception of those in fine arts, they also participated in the same types of activities and to about the same extent; student teachers in fine arts participated more in total school and community activities than student teachers in other areas; the average amount of time in minutes of student-teacher participation in instructional activities was about the same in all subject areas; activities directly associated with classroom teaching were judged by most student teachers to be of greatest value; most student teachers were not given enough responsible classroom teaching; student teachers



and their supervising teachers were not in general agreement as to the degree of attainment of the objectives of student teaching, and neither group judged that the objectives had been adequately attained; optimum achievement of all objectives of the student-teaching program cannot be realized until provisions are made for student teachers to participate more fully in those activities that normally lead to the development of competencies set forth in the statement of these objectives; and the suggestions for improving the student-teaching program offered by student teachers and their supervising teachers were generally of a constructive nature, and both groups agreed that the program could be improved by providing more practical courses in theory and methods and by scheduling more time for student teaching.

It is recommended that the objectives of the student-teaching program should be more clearly established and better understood through the co-operative efforts of those persons concerned with the program; supervising teachers should place more emphasis on leading student teachers to understand the real nature of their difficulties; more directed professional laboratory experiences should be provided for prospective teachers prior to student teaching; the total load of the prospective student teachers should be thoroughly examined so that student teachers will have time to realize their possibilities in student teaching; student teachers should be provided the opportunity to participate in more total school activities, community activities, and responsible classroom teaching; greater emphasis should be placed on the supervision, guidance, and evaluation of student teachers during their student-teaching experience; and supervising teachers and administrators of the student-teaching program should work co-operatively in selecting those activities of student teaching which will more nearly lead to attainment of the objectives of the program.

317 pages. \$3.98. MicA 55-2077

AN ANALYSIS OF THE STATUS  
OF BUSINESS EDUCATION  
IN THE PUBLIC SECONDARY SCHOOLS  
OF WISCONSIN IN 1953-54, WITH SPECIAL EMPHASIS  
ON METHODS, MATERIALS, AND EQUIPMENT USED  
IN THE TEACHING OF THE SKILL SUBJECTS

(Publication No. 12,929)

Morgan Irwyn Thomas, Ph.D.  
State University of Iowa, 1955

Chairman: Professor William J. Masson

This study was conducted to analyze the present status of business education in the public secondary schools of Wisconsin, placing special emphasis on the methods, materials, and equipment used in the teaching of the skill subjects.

In order to ascertain the status of business education in the public secondary schools of Wisconsin, the data on file in the office of the State Superintendent of Public Instruction were obtained, classified, and tabulated. In addition, a questionnaire was mailed to the business education department of every public secondary school in the state

and the results obtained were also classified and tabulated.

The analysis of these data was then carried out through an exhaustive comparison of the present status of business education in Wisconsin as revealed by this study with the standards for business education as set out in the "Business Education Handbook for the Secondary Schools of Wisconsin," and the 1948 Yearbook of the American Business Education Association.

The information from the State Department of Public Instruction consisted of complete data concerning the teacher and class schedules as well as certain other general information about the school. This information was complete for all of the public secondary schools in Wisconsin, 438 schools in all.

The information from the questionnaires consisted of returns from 332 of the 438 schools contacted. These 332 schools were 76.7 per cent of the total. Data collected in the questionnaire emphasized the methods, materials, and equipment used in the teaching of the skill subjects.

All of the information referred to in the above two paragraphs was tabulated by school classes for more adequate comparisons. These classes consisted of schools enrolling 0-100 students; 101-200 students; 201-500 students; and over 500 students.

The analysis of the data gathered in this study resulted in the following conclusions:

1. Wisconsin's business teachers are well qualified for teaching business subjects in that 96.4 per cent of these teachers are legally qualified through state certification for their jobs.
2. The mean average years of total experience for Wisconsin's business teachers ranges from 6.0 years in the smallest schools to 19.2 years in the largest schools.
3. Salary data clearly pointed out that the salaries of teachers in the larger school systems are decidedly above those teachers in the smaller school systems.
4. The overall average for business education teachers in Wisconsin, 1952-53, was \$3781.36 as compared with the national estimated average for all teachers that year of \$3530.
5. Salaries, while showing a positive correlation to property valuations, are definitely affected by geographical and sociological considerations.
6. The vast majority of Wisconsin's secondary schools confine their instructional pattern in business education to the offering of the three subjects — typewriting, shorthand, and bookkeeping.
7. The field of clerical practice is receiving little stress in the secondary schools of Wisconsin while shorthand and its related subjects have received great emphasis.
8. While it was highly recommended that job-opportunity surveys and follow-up studies be made at least every five years, only a small minority of schools reported such studies.
9. Few business teachers have a classroom teaching pupil load of over 30 students, overloads for the most part are confined to a few of the larger schools.
10. Shorthand teachers are making little use of diagnostic and prognostic tests.
11. A majority of the typewriting classrooms do not have tables and chairs which are adjustable to pupil height.
12. Business teachers need minors outside of their field especially in the first years of teaching.

367 pages. \$4.59. MicA 55-2078

## EDUCATION, THEORY AND PRACTICE

A STUDY OF SELECTED PRACTICES  
REPORTED IN THE TEACHING OF READING  
IN THE KINDERGARTEN AND PRIMARY GRADES  
IN NEW YORK STATE

(Publication No. 12,685)

Bernard Reginald Belden, Ph.D.  
Syracuse University, 1955

**PURPOSE:** To determine the extent to which certain selected practices are used in the teaching of reading in the kindergarten and primary grades of New York State, as reported by the teachers.

**PROCEDURES FOLLOWED:** Questionnaires were developed for each of the grades concerned covering the instructional tasks and procedures involved in primary reading instruction. The questionnaires were completed by 1,000 kindergarten and primary teachers in 136 elementary schools, chosen at random. The responses given on the questionnaires were then tabulated according to frequency of use of the various practices listed.

**RESULTS:** Some of the specific findings were: (1) Most of the training in reading readiness takes place in the first grade, while the kindergarten program is directed more toward the general adjustment of the child to the school situation. (2) A large majority (96%) of the teachers group their pupils for reading instruction in order to provide for varying abilities and progress. (3) Only five per cent of the first-grade teachers indicated that their slowest children begin to read after the sixth month of school. (4) The responses indicated that most primary teachers teach the use of phonetic analysis in recognizing new words, along with other word-recognition techniques. (5) Most primary teachers recognize the value of introducing a reading selection by stimulating the children to think along the lines of the selection by the use of such devices as discussion, audio-visual aids, etc. (6) The responses indicated that first-grade teachers make more frequent use of a greater variety of supplementary reading materials than second- and third-grade teachers, as well as greater use of teacher-prepared materials. (7) The various kinds of seat-work activities frequently used by the teachers indicate a gradual progression, from the first to the third grade, from concentration on exercises concerning individual words, sounds and letters, to exercises involving keener comprehension of material read, and greater understanding of the various uses of words. (8) First-grade teachers pay considerably more attention than do second- and third-grade teachers to the meaning difficulties contained in the materials used. (9) The responses indicated that although many teachers do follow practices in the teaching of content subjects which also aid in the development of reading ability, the possibilities of providing reading instruction in these subjects are not fully utilized. (10) Informal teacher- or school-made word-recognition tests are most frequently used by primary teachers to measure achievement. The use of standardized tests increases in each successive grade.

**CONCLUSIONS:** The emphasis given to those elements of the reading program intended to develop understanding,

background, and experience makes it evident that kindergarten and primary teachers no longer regard reading as a mere mechanical process concerned with the mastery of distinct reading skills. However, the results of the study also imply the need for improvement in several phases of the reading program provided in these grades. In some instances improvements may be initiated by the teacher, and in other instances the direct assistance of the administrator is required. Professional educators and publishers of professional and classroom materials may also contribute to the further improvement of teaching practices in the field of reading by re-examining the content of courses of study, and materials published for school use in the light of current practices used in the teaching of reading.

173 pages. \$2.16. MicA 55-2079

A STUDY OF REMEDIAL ARITHMETIC  
CONDUCTED WITH NINTH GRADE STUDENTS

(Publication No. 13,200)

Allen L. Bernstein, Ed.D.  
Wayne University, 1955

Large numbers of students enter our high schools with deficiencies in arithmetic. Out of the necessity for formulating a program to meet this problem, a related series of studies at Cody High School, Detroit, Michigan, culminated in the establishment of Mathematics Clinics, giving individualized instruction in small groups.

The mechanics of the study included:

1. A review of the literature, yielding conclusions independent of the rest of the study.

2. A testing survey of a large group of ninth grade students, in which the Iowa Every Pupil Test of Basic Skills, the Cody High School Diagnostic Arithmetic Test, and tests of mastery of the basic tables of fundamentals were examined in terms of a program of classification and instruction. The Diagnostic Test was examined for the nature of the deficiencies found, and the interrelationships among them.

3. Special corrective exercises were developed from the results of (2), used as class lessons, and for individualized instruction in small groups. Fifty-nine cases were completed in the final phase of individualized teaching.

4. Evaluation was made on the basis of retest scores, primarily in the Cody High School Diagnostic Test, and on the basis of qualitative observations made of the students concerned.

1. Conclusions from the Literature:

A. The principles discussed by Fernald (Remedial Techniques in Basic School Subject, McGraw-Hill, 1943), appear consistent with other studies and this one.

B. Individualized instruction was more effective than group instruction in all situations.

C. The pupil teacher relationship is a major factor in learning arithmetic:

1. Student attitudes will affect learning and be changed by it.
2. Attitudes of teachers toward arithmetic must be examined during their training.



D. Effective programs were based on a diagnostic review of errors, many of which are random rather than patterned.

E. Error patterns are consistent from one study to another.

## 2. Conclusions from the Testing Survey:

A. Since the highest correlation between tests was .64, no single test could serve as a satisfactory classification tool. The following inference was made from qualitative observations. The examination situation, rather than the test itself, is a major factor causing invalid scores. Nervousness, poor timing, headaches, lack of motivation, etc., are causes of low scores.

B. Diagnosis of error patterns from a paper are valid for introduction to instruction only.

C. Error patterns were studied in pairs. Of seventy-eight paired relationships, forty-one were significant. Examination of these indicates a two category causal theory, (a) misunderstanding the nature of the number system, and (b) general personality factors.

D. Eighty percent of the error patterns diagnosed were in three categories:

1. The use of zero in multiplication and division.
2. The borrowing process in all kinds of subtraction.
3. Understanding and use of the decimal point in all four processes.

## 3. Conclusions from Experimental Teaching:

Students in both large classes and Mathematics Clinics showed significant gains in achievement as a result of the instruction. The control group gained 1.2 points, the Remedial Classes 13.9 points and the clinical students 23.3 points on the Cody High School Diagnostic Test (mean gains). The mean number of lessons per student in the Mathematics Clinic was 17.2. Individualized instruction accomplished about twice as much as class instruction in much less time. In addition, it was observed that many students exhibited gains in overall school adjustment, self confidence, self understanding, and easing of character disturbances. Also important was the expression by many of greater liking for mathematics. The obvious recommendation for programs of individualized teaching to a greater degree than heretofore practiced, and a shift in emphasis from rote to meaningful teaching, are natural results of the conviction gained from such teaching, that the problems of education are but partly the problems of the intellect. They are much more the problems of the human spirit.

265 pages. \$3.31. Mic 55-270

## THE STATUS AND CHARACTERISTICS OF SEVENTH AND EIGHTH GRADE READING INSTRUCTION IN NEW YORK STATE PUBLIC SCHOOLS AS REVEALED BY THE OPINIONS OF PROFESSIONAL STAFF MEMBERS

(Publication No. 12,708)

Donald Leverett Buck, Ed.D.  
Syracuse University, 1955

### Statement of the Problem and Nature of the Research

The writer's research involved the following problem: What are the characteristics of and current practices in the teaching of reading in the seventh and eighth grades of New York State public schools? To carry out the research the normative-survey approach was utilized.

### Method

To collect data a questionnaire was developed which included the following areas: Professional training, experience backgrounds, and opinions relative to reading of staff members; reading instruction in the content areas; specific or developmental reading instruction; remedial reading instruction; supervisory procedures; evaluation and appraisal; library facilities and materials of instruction.

Data were secured from a representative sample of 103 schools covering the four types of school organizational plans of which the seventh and eighth grades may be a part, a wide range of enrollments, and all geographic areas of New York State, New York City excluded.

### Findings

Study of the data which, by necessity, represented the opinions of staff member, revealed that:

1. As a group, seventh and eighth grade staff members, directly or indirectly responsible for instruction in reading appear to have somewhat inadequate professional training relative to the teaching of reading.
2. Most content subject teachers appear to hold the opinion that they are endeavoring to develop the reading skills associated with their respective subject matter areas. However, the factor of individual reading ability does not appear to be given much consideration in the general aspects of the school program such as the organizing of class sections.
3. In schools providing developmental reading instruction such instruction is apparently considered a function of the school English program.
4. Remedial reading instruction appears to be provided on some basis in a large percentage of schools usually as a part of the English program. However, relatively little is apparently done to determine basic causes of reading deficiencies through the use of reading specialists or clinical facilities.
5. The administering of standardized reading tests in seventh and eighth grades appears to be a general practice although follow-up programs based on test data appear to be lacking.
6. Library facilities and related library instruction at

the seventh and eighth level were reported as adequate by most teachers and librarians. In the content subject areas the practice of using a single basic text for all pupils appears to prevail.

#### Conclusions

1. Organized reading programs commonly found at primary and intermediate grade levels do not appear to exist on as extensive a scale at the seventh and eighth grade level. Reading instruction in the seventh and eighth grades appear to be contingent upon the quality of leadership prevailing in a school and the initiative and capabilities of individual staff members.
2. Reading instruction, in the general sense of the term, appears to be a function of the English program, at the seventh and eighth grade level.
3. Except for the relatively few registered junior high schools with large enrollments, located in well-to-do urban communities, the factors of type of organizational plan, size of enrollment and geographic location in New York State do not appear to affect practices in the teaching of reading in the seventh and eighth grades.

177 pages. \$2.21. MicA 55-2080

#### WOOD LAMINATING AND ITS IMPLICATIONS FOR INDUSTRIAL ARTS

(Publication No. 12,768)

John Hugh Capron, Ed.D.  
The University of Florida, 1955

This study consists of a thorough analysis of the wood laminating industry, its history, materials, methods, and products. The information was gained by the survey of data presented in technical and trade publications and by actual visitation in manufacturing plants which specialize in the production of laminated wood products.

The study reports on the current philosophy of industrial arts and establishes the relationship which should exist between a technical area, such as wood laminating, and the industrial arts curriculum in the modern school.

The final portion of this study suggests in detail a large number of problem areas which would be suitable subjects for study by the various grade levels of industrial arts students. In addition, a number of suitable laboratory projects, which may be constructed by the wood laminating method, are described and pictured.

169 pages. \$2.11. MicA 55-2081

#### PERCEPTIONS OF CLASSROOM TEACHERS AND SCHOOL ADMINISTRATORS CONCERNING CURRICULUM DEVELOPMENT IN A SUBURBAN SCHOOL SYSTEM

(Publication No. 13,201)

Paul D. Carter, Ed.D.  
Wayne University, 1955

This inquiry was designed to determine the perceptions of professional personnel of a suburban school system relative to seven aspects of the curriculum, its study and improvement: (1) definition, (2) status, (3) desirable directions of change, (4) organization for study and improvement, (5) resources for effecting change, (6) degree of flexibility, and (7) responsibility for study and improvement.

Perceptions were obtained by means of a curriculum concepts inventory in which the respondents rated structured responses to questions pertaining to each of the seven aspects listed above, and were invited to write in free comments.

Evaluative criteria were formulated from a thorough review of the professional literature as a set of standards against which to judge the level of development of the perceptions of the professional staff.

The school system, located in a residential community, is favored with excellent facilities, an above average ability student population and good community support. In per capita (student) expenditures and average class loads, it occupies second place among the schools of the county. The teaching and administrative staffs are well-trained and fairly young — the mean experience for all professional personnel is 4.6 years.

Inventories were returned by 228 teachers and principals or 75 per cent of the faculty. Distribution of returns were representative of all levels and experience brackets.

The main conclusions obtained from the study were:

1. The concept of curriculum held most commonly by members of the staff is that curriculum consists mainly of experiences with subjects-to-be-studied and skills-to-be-learned.
2. There is very limited perception of need for a fundamental reorganization of the basic curriculum structure.
3. There exists a considerable degree of faculty interest and readiness to work on curriculum problems contingent upon (a) worthwhile projects, (b) reasonable accomplishment, (c) resolution of the "time problem", (d) facilitating operational framework, and (e) adequate resources.
4. Members of the professional staff perceive curriculum study to be a cooperative enterprise of teachers and administrators. There is recognition of the importance of: (a) motivations proportional to the magnitude of the undertaking; (b) coordination of endeavors at all levels; (c) over-all planning on a system-wide basis; (d) an adequate system of communication; and (e) the reaching of agreements on major curriculum issues.
5. Recognition of the roles of students, parents, and lay citizens in curriculum planning and decision-making is very limited.
6. There is evidence of moderate recognition of the effects of interpersonal relationships upon cooperative enterprises.



7. There is a consensus that teachers and principals should assume more active roles in curriculum development work.

#### Implications for Public School Personnel

1. The establishment, execution, and sustenance of an organized program of curriculum study and improvement is a necessary and fundamental phase of public school operation.

2. Improvement of the curriculum implies improvement of the learning experiences of children and youth.

3. Improvement of the school curriculum requires involvement of people in group endeavors in addition to individual teacher invention and experimentation.

4. Responsibility for improving the curriculum is shared by teachers, administrators, students, parents and other citizens.

5. Designated leadership has a special responsibility to provide opportunities for participation and conditions favorable to group productivity.

6. Curriculum development is an evolutionary process.  
228 pages. \$2.85. MicA 55-2082

#### A COMPARATIVE STUDY OF AIMS HELD BY PARENTS, STUDENTS, AND TEACHERS FOR AN ENGLISH PROGRAM IN A SUBURBAN HIGH SCHOOL

(Publication No. 13,203)

Stanley Snider Cook, Ed.D.  
Wayne University, 1955

The purposes of this study are to examine the major shifts in the thinking of leaders in the planning of the English language curriculum since 1935, to determine the degree to which that thinking has modified practice and theory in a large suburban high school, and to project further modifications in terms of specific readiness for change among students, parents, and teachers.

Information concerning advanced theory came from publications of the several curriculum commissions of the National Council of Teachers of English. Accommodations to that theory in a local program were described in a review of the courses of study and the departmental records at Grosse Pointe High School, Grosse Pointe, Michigan.

To measure the acceptance of modern theory and the retention of traditional aims in the attitudes of concerned persons, an opinionnaire was prepared. Fifty representative aims taken from actual courses of study and from professional literature were rated on a five-point scale indicating the degree to which those aims were considered to be the proper business of a high school English program. The opinionnaire was submitted to high school students, parents, English teachers, high school graduates now taking college freshman English, and directors of college freshman English in colleges attended by Grosse Pointe graduates.

Data from the opinionnaire were considered as to the priority of importance which each group of respondents placed upon categories of aims primarily related to formal language patterns, to personal and social goals, to the mass media of communication, to writing, to speaking, and to reading. Also considered were measures of

agreement within and between the several groups of respondents.

Although the opinionnaire itself does not provide for the reason a respondent might rate a particular item as he does, many unsolicited comments are considered as part of the data and are quoted in the study.

Among the more important findings, it was learned that parents, high school students, and college freshmen in the Grosse Pointe situation are well agreed upon the importance of formal language study and skill in writing. They are less willing to assign high school English time to the meeting of personal and social needs, or to learning to use and to live with the mass media of communication. Comments indicate that some of the recent changes from traditional language teaching have been tolerated rather than generally understood and accepted by parents and students. On the other hand, parents and students indicate a willingness to replace the author-period-type approach to literature.

English teachers generally attach importance to all categories of aims, both traditional and modern. Grosse Pointe High School English teachers give the lowest rating to the formal language goals, while the college teachers rate it highest among the several categories. Comments indicate that whereas some college teachers think grammar should be taught as a discrete prerequisite to communication skills, others prefer all formal patterns in English to be taught functionally.

Implications for improving the English program in the setting studied include the following:

1. Parents would more readily accept change if they understood the developmental nature of learning, the concept of integration, and the interrelation between student purpose and student achievement.
2. Students are more traditional in their attitudes than had been expected. More pupil-teacher planning and more student evaluation of both language and non-language goals should make existing and projected aims more acceptable.
3. No one pattern of high school English can anticipate the varied aims and methods of more than a few college freshman English courses. The immediate needs of the students themselves seems to be a more valid criterion for course planning.

167 pages. \$2.09. MicA 55-2083

#### A STUDY OF THE CHARACTERISTICS OF GOOD AND POOR READERS OF SOCIAL STUDIES MATERIALS AT THE ELEVENTH GRADE LEVEL

(Publication No. 13,055)

Harold Manfred Covell, Ed.D.  
The Florida State University, 1955

The purpose of this dissertation was to investigate the characteristics of good and poor readers of social studies materials at the high school level. To do this a two-fold approach was utilized. First, an extensive testing program was administered to one hundred and one eleventh grade American history students. This program consisted of a criterion test of Ability To Interpret Reading Materials in

the Social Studies, Test 5 of the Iowa Tests of Educational Development, which was used to differentiate "good" from "poor" social studies readers. In addition, standardized tests of mental ability, general reading ability, and personality were given to the subjects of this study. Also, the socio-economic status of each student's family was determined by the Minnesota Scale of Paternal Occupations. Statistical procedures were then used to establish the objectively measurable characteristics of these good and poor readers of social studies materials.

The second approach to this problem consisted of intensive case studies of the ten best and the ten poorest readers of social studies materials. The case studies involved an investigation of each student's home and community environment, a study of his past and present school career and activities, and a series of interviews with his teacher, his counselor, and the student himself. The most significant data were secured by means of focused or depth interviews with each of the twenty students who were case study subjects.

Some of the more pertinent findings from this research were as follows: (1) Good social studies readers possess a broad and deep vocabulary of the technical language used in the social studies while the technical vocabulary of poor social studies readers is weak and limited in scope. (2) Good social studies readers have a rich and accurate understanding of time and place concepts; poor readers of social studies materials possess very vague and poorly developed concepts involving time and place. (3) Good social studies readers have a command of the metaphorical language of this subject while poor social studies readers do not. (4) Good readers of social studies materials demonstrate a pattern of strength in general and technical vocabulary, and sentence and paragraph comprehension; poor social studies readers are weak in all aspects of general reading ability. (5) Compared with good readers, the poor readers of social studies materials are at least a year retarded in school and exhibit an increasingly unsatisfactory grade in academic achievement as they advance in school. (6) Good social studies readers have "average" or better intelligence; poor social studies readers are almost all of "average" or lower I.Q. (7) Good readers of social studies materials come almost entirely from the middle and upper classes on the socio-economic scale. Poor readers usually come from homes that are classified in the middle or lower classes on this scale. (8) Good social studies readers are liberal in their social views, are usually very active in school and community affairs, and tend to be conservative in their economic thinking. Poor readers of social studies materials, on the other hand, are characterized by an attitude of ineffectual vagueness or absolute indifference to school, their peers, and to society in general. (9) Good social studies readers like reading and are very heavy readers. Poor social studies readers dislike reading and tend to avoid it as much as possible.

298 pages. \$3.73. MicA 55-2084

## THE EFFECTS OF INCREASING THE RATE OF DICTATION OF THE NUMBER COMBINATIONS ON CHILDREN'S ACCURACY OF RESPONSE

(Publication No. 13,327)

William Charles Gemeinhardt, Ph.D.  
University of Minnesota, 1955

### Purpose

The purpose of this study was to determine: (1) the effects of increasing the rate of speed of dictation of the multiplication combinations on children's accuracy of response; and (2) the testing procedure by which the best estimate of the children's knowledge of the multiplication combinations can be secured. The procedures tested included an audio-visual method and an audio-only method.

### Procedure

A review of the research in the area of testing children's knowledge of the number combinations reveals the lack of a mechanical device with which a classroom teacher can present the number combinations at various rates of speed to either individual children or the entire class.

Caddy-Imler Creations Inc. has produced a series of phonograph records on which the number combinations are dictated at three different rates of speed — one combination per six seconds, one combination per four seconds, and one combination per two and a half seconds. The combinations in each operation are divided into "easier" and "more difficult" combinations on the basis of the size of the answer.

Six fourth grade classes in the Robbinsdale, Minnesota Public Schools were selected on the basis of a power test of multiplication examples with one-place multipliers. The 221 children were given a series of six tests in which the combinations were dictated at three rates of speed using both methods of testing. Five additional tests measured: (1) their ability to solve multiplication examples with one-place multipliers; (2) their ability to record the products of the combinations under unlimited time conditions; (3) their ability to find the sums needed in carrying in the multiplication examples; (4) the rate at which they could copy numbers, and (5) their ability to recognize generalizations found in multiplication.

### Conclusions

Conclusions pertaining to the easier combinations:

1. Increasing the rate of speed of dictation resulted in a decrease in children's scores when either the audio-visual or the audio-only method of testing was used. For most children this decrease was relatively small; for others, there was a marked decrease.
2. The differences between the two methods of testing were statistically significant favoring the audio-visual method.
3. The differences between the controlled time tests and the unlimited time test were statistically significant favoring the unlimited time test.

Conclusions pertaining to the more difficult combinations:

1. Increasing the rate of speed of dictation resulted in a decrease in children's scores when either the



audio-visual or the audio-only method of testing was used. For most children there was a marked decrease; for others, the decrease was relatively small.

2. The differences between the two methods of testing were statistically significant favoring the audio-visual method.
3. The differences between the controlled time tests and the unlimited time test were statistically significant favoring the unlimited time test.

#### Other conclusions:

1. There was a close relationship ( $r = .767$ ) between the ability to record the products of the combinations under unlimited time conditions and ability to solve multiplication examples with one-place multipliers.
2. There was a positive relationship ( $r = .525$ ) between ability to solve multiplication examples and ability to recognize generalizations in multiplication.

#### Implications

1. In testing children's knowledge of the number combinations, the time allowed for responses should be controlled and set at a rate at which the use of round-about methods of work is reduced to a minimum.
2. The method of testing seems connected with the children's level of development in the particular process. The audio-visual method gives a more reliable measure at the more immature level of development.
3. The accuracy of response by individual children depends on the conditions under which their knowledge of the combinations is tested.

270 pages. \$3.38. MicA 55-2085

### THE TEACHING OF SHORTHAND PRIOR TO 1900

(Publication No. 13,219)

Edna Lyndall Gregg, Ed.D.  
Indiana University, 1955

#### The Problem

The problem is an historical study of shorthand instruction prior to 1900.

#### Procedure

The approach to the study of the problem was the historical method of research, which involved preparation of a bibliography as comprehensive as library resources in the United States afforded. The search was concentrated on published and unpublished documents pertaining to instruction in shorthand from 1793 to 1900. The documents were housed primarily in The New York Public Library and in libraries of several major universities. All items in the bibliography, presented in Section II of the report, were carefully read and thoroughly analyzed.

#### Characteristics of Shorthand Instruction Prior to 1900

Two predominant characteristics pertaining to shorthand instruction prior to 1900 were apparent in an analysis of the massive amount of data obtained. First, the primary objective of shorthand shifted from general education to

vocational use with the advent of the typewriter as a business machine about 1880. Second, the kinds of schools in which shorthand was taught, the conditions under which instruction was given, and the methods of instruction varied with the changes in objectives. The period from 1793 to 1880, in which the general education objective predominated, is designated in this study as the Early Period; and the period from 1881 to 1900, in which the vocational objective was developing, is designated the Business School Period. The latter was so named for the type or kind of school in which shorthand was taught during that period.

**Informal instruction.** Shorthand was learned primarily through self-instruction prior to 1842. The brief manuals of most shorthand systems contained one or two pages of directions for self-instruction, the system's alphabet to be committed to memory, a few shorthand plates to be read, and printed exercises to be converted into shorthand. The student was directed to continue skill development after completion of the shorthand manual by turning printed matter into shorthand and by writing in shorthand sermons and other public addresses as they were spoken. Throughout the era of self-instruction, shorthand was studied to provide an easier and simpler medium than longhand for written communication.

**Classroom instruction.** Self-instruction in shorthand predominated until about 1842, when Isaac Pitman and his associate introduced group instruction in a brief course offered by itinerant teachers. The brief course provided instruction based on exercises in the manual, drill in reading shorthand from the blackboard and from plates in supplementary readers, and practice in writing shorthand from dictation. Legibility of shorthand notes received greater emphasis in early classes than speed of writing.

Approximately 1880, the demand for competent stenographers resulting from the advent of the typewriter in business offices was responsible for the shift in the objective for learning shorthand: from a medium of personal writing to vocational use. Emphasis on such aspects of instruction as memorization of rules, nature of practice materials, and speed of dictation varied widely in specific methods of instruction employed by teachers. Writing from dictation was introduced early by some teachers, delayed by others.

Transcription of shorthand to longhand was unimportant when shorthand was used primarily for personal communication, but typewritten transcripts became essential when shorthand was employed for vocational purposes. Use of shorthand in business offices made the stenographer's ability to transcribe shorthand notes into typewritten forms equally as important as the ability to write from rapid dictation and to read shorthand notes. Soon after the introduction of the typewriter, instruction in shorthand included some transcription in typewritten form. Proficiency in shorthand writing was soon measured in rate per minute of dictation; in transcription, mailability or usability of the typewritten product.

405 pages. \$5.06. MicA 55-2086

# THE DEVELOPMENT OF THE WORK-STUDY SKILLS IN SELECTED ELEMENTARY SCHOOL TEXTBOOKS

(Publication No. 13,196)

Betty Jeanne Humphry, Ph.D.  
State University of Iowa, 1954

Chairman: Prof. A. N. Hieronymus

## Purpose

The purpose of this study was to determine the nature and extent of the development of specific work-study skills in textbooks currently used in the elementary school from Grades 3 through 8. The work-study skills selected for investigation were:

- 1) Knowledge and use of map materials (types of maps, geographical concepts involved in map reading, and skills involved in map reading)
- 2) Knowledge and use of graphic and tabular materials (types of graphs and tables, and skills involved in their use)
- 3) Knowledge and use of reference materials and skills related to their use (dictionary, encyclopedia, almanac, atlas, table of contents, index, glossary, appendix, bibliography, alphabetizing, taking notes, outlining, and using the library)

## Procedure

A total of 206 textbooks in social studies, arithmetic, reading, language, and science and health, were examined page by page for the work-study skills materials listed above. The criterion for selecting textbooks was the opinion of staff members of the University of Iowa, each of whom is a specialist in a particular subject matter area of the elementary curriculum. The page was used as a unit for tabulation purposes; thus, the results were obtained in terms of the total number of pages devoted at least in part to each concept or skill.

## Results

### Knowledge and Use of Maps

Maps were classified into ten major types and ten special-purpose types. Six major classes of geographic concepts were identified. Fifteen map reading skills were included for investigation.

A large number of maps are to be found in textbooks from Grade 4 on, but relatively little is done with maps in Grade 3. Textbooks in the social studies area make the most systematic and extensive contributions to skill in map reading, although certain unique contributions are made in the other subject areas, particularly in arithmetic and science. There appears to be considerable variation in the extent to which different textbook series provide systematic instruction in the use of map materials. Many maps are introduced with little or no accompanying explanation or instruction in their use. While considerable practice is given in simple locational skills, relatively less emphasis is placed on drawing inferences concerning relationships of political and climatic factors, to man's use of land and his way of living. There is also some question as to whether the maintenance program is sufficient to assure permanent mastery of certain of the

relatively complex concepts and skills of high social utility value. With most textbook series, the teacher must plan to supplement the text explanations if pupils are to develop any very thorough understanding of what maps show.

### Knowledge and Use of Graphic and Tabular Materials

Graphs and tables and related skills were classified according to type and degree of complexity. While some graphic and tabular material was presented in the third and fourth grades, the systematic instructional program begins, for the most part, in Grade 5. Practically all of the formal instruction is contributed by arithmetic textbooks. Books in other subject areas employ graphs and tables frequently with little or no instruction in their use. Skills involving reading, comparison, and computation are developed fairly extensively, but the more complex skills involving critical interpretation, discerning trends, etc., receive little emphasis, even in the upper grades.

### Knowledge and Use of Reference Materials and Skills Related to Their Use

The formal introduction of the dictionary occurs consistently in fourth grade language and reading series, although practice in alphabetizing and constructing word lists is provided in Grade 3. Continued practice in the use of the dictionary and instruction in more complex skills is provided at all subsequent grade levels. Some instruction in the use of the encyclopedia begins as low as the fourth grade level, but even in the upper grades relatively little emphasis is devoted to its use. Atlases and almanacs are rarely referred to in textbooks even in Grades 7 and 8. Some use is generally made of the table of contents in the first two grades. Considerable practice in its use is given in Grade 3 and at subsequent levels. The explanation and use of the index generally begins in Grade 4 with continued practice in succeeding grades. Alphabetizing is taught for the most part, in the third and fourth grades. Outlining, note taking, and special skills involved in the use of the library are taught fairly extensively in Grades 6, 7, and 8.

While there is a considerable quantity of textbook material appropriate to the development of proficiency in the work-study skills, the school must take the responsibility for selection and organization if its offerings in this area are to be comprehensive and systematic.

613 pages. \$7.66. MicA 55-2087

## READABILITY OF COLLEGE GENERAL BIOLOGY TEXTBOOKS AND THE PROBABLE EFFECT OF READABILITY ELEMENTS ON COMPREHENSION

(Publication No. 12,703)

Alexander Gregory Major, Ph.D.  
Syracuse University, 1955

This study was designed to determine whether the currently-used and preferred college general biology textbooks are written within the estimated reading comprehension level of freshman students, and to determine the manner in which the readability elements of biology material should be altered to achieve maximal comprehension.



It was limited to a consideration of those variables which can be used as predictors of readability, and which are incorporated into and quantitatively measured by readability formulas. Rudolf Flesch's reading-ease formula was employed to estimate the probable grade level of readability. The population consisted of liberal arts freshmen students who were not likely to major in the biological sciences. About two hundred students were randomly divided into three groups with approximately the same number of above average, average, and below average students in each group. The differences in comprehension on graded reading material were considered significant at the five per cent level of confidence. The investigation was conducted in three phases.

The first phase was concerned with the readability elements of vocabulary load and concept load in a biology passage. Three graded biology passages were constructed with estimated readabilities at approximately the tenth, twelfth, and fourteenth grade levels. The vocabulary load of the most difficult passage was reduced approximately two grade levels by definition, example, or context. The readability of the third passage was reduced two additional grade levels by eliminating the less essential biological terminology. There was significant improvement of comprehension when the vocabulary load was reduced and when both the vocabulary and concept loads were reduced. The improvement was limited to above average and average students.

A nation-wide survey was conducted in the second phase to determine the ten general biology textbooks which were most extensively-used and preferred during the academic year 1953-54. According to the data obtained from every tenth page, the mean readability score for the books ranges from the lower quartile to the median of the difficult category. Since each of these textbooks was written with an average sentence length which is characteristic of eighth to tenth grade reading material, the estimated difficulty is due to a high syllable index which is a measure of scientific and non-scientific word complexity. According to the findings of the first and second phases, above average students will probably encounter difficulty with 32.8 and 70.8 per cent and the average students 53.6 to 84.7 per cent of the reading assignments in the respective textbooks. These difficult passages occur as frequently at the beginning as in any other section of the textbooks.

The third phase was concerned with the readability elements of number of syllables per one hundred words and the average number of words per sentence. Three graded excerpts pertaining to a common area of biology were selected from biology textbooks. The estimated readability of the most difficult excerpt was written at the students' grade level which was also the average readability of the textbooks analyzed. The second excerpt was one grade level and the third excerpt was at least two grade levels below the difficult excerpt. The increased readabilities were due to reduced sentence length and reduced syllable count, respectively. Significantly improved comprehension was achieved by above average students when the readability was increased by one grade level and by average students when the readability was increased by at least two grade levels.

Freshman students in other colleges would probably demonstrate similar differences in comprehension since the mean score of the students employed was slightly above the national norm of the national college testing program.

117 pages. \$1.46. MicA 55-2088

## EFFICIENCY IN FIRST YEAR ALGEBRA

(Publication No. 12,845)

Philip Peak, Ph.D.  
Indiana University, 1955

### Problem

It was the purpose of this study to determine the extent to which the teaching of first year algebra has enabled the student to reach a selected number of goals accepted for first year algebra. Secondly, to determine the characteristics of the teachers and the schools whose students attain these goals. The specific questions raised were briefly:

- (1) Do the students solve problems in a neat and understandable form?
- (2) Do the students use their knowledge of arithmetic in working algebra?
- (3) Do the students work efficiently?
- (4) Do the students attain efficiency in problem analysis?
- (5) Do the students do mathematical thinking in life situations?
- (6) Do the students think quantitatively and can they make reliable estimates?
- (7) Do the students understand the language of mathematics?

### Design of the Study

The selected aims were chosen from the "Improvement Sheet for Algebra" by Dr. Franzén, and the test used was "Efficiency Test in First Year Algebra." This test, which was originally developed by Dr. Franzén, was given several trial runs in the present study, carefully analyzed and a few necessary changes made. Mathematics leaders in Illinois, Indiana, Kentucky, Michigan, Ohio and Wisconsin selected 25 schools from his state to represent all types. Each school selected one first year algebra class to which they administered the "Efficiency Test in First Year Algebra." The final cooperating schools consisted of 119 schools, 129 classes enrolling 3,327 pupils. The results of these tests were analyzed by separate items. If 75% of the class was successful on the item the class was considered successful.

### Findings

- (1) 83% of the classes could do the division of a fraction in arithmetic but only 9% could do a similar algebra problem.
- (2) Only 25% of the classes could solve either an arithmetical or algebraic problem involving addition of fractions with unlike denominators.
- (3) 97% and 87% of the classes were successful in multiplication of denominate numbers in arithmetic and algebra, respectively.
- (4) 87% of the classes had the correct concept of negative but less than 20% had a clear concept of binomial, term, simple equation, variable, unlike terms, factor, exponent, literal coefficient or product.
- (5) 84% of the classes could efficiently find mistakes when results fail to check.
- (6) Only 2% of the classes could correctly arrange expressions involving exponents.
- (7) Only 2% of the classes could correctly label a solution or recognize when it was incorrectly labeled.

- (8) In the translation of an equation into language only 3% of the classes were successful.
- (9) Approximately 20% of the classes could recognize and eliminate unnecessary steps.
- (10) Only 1 class out of 129 could satisfactorily analyze a problem.
- (11) The percentage of classes who could successfully recognize a life problem ranged from 97% on a problem of buying steak to 8% on a problem of income tax.
- (12) 2% to 28% of the classes were able to make satisfactory estimates on five different problems.
- (13) Classes from large schools did better in the use of arithmetic, symbols, and in analyzing the usefulness of the problem.
- (14) The classes from independent schools\* did better on finding mistakes, checking errors, arranging exponents and stating all elements of the problem.
- (15) Classes of 16-25 students did better on finding mistakes and securing all results while that of 1-15 students did better on estimation.
- (16) The classes taught by teachers with over 8 years of experience did better on fundamental operations and finding mistakes.
- (17) Classes whose teachers had four years of college training did better on the fundamentals, but not in other areas, while classes whose teachers had over five years of college did better in the use of tens and symbols and in handling exponents.

#### Conclusions

- (1) Students have not been taught so that they use their knowledge of arithmetic in algebra, have a clear concept of terms and symbols, can properly label problems, can translate an equation into a verbal statement, can estimate results, can recognize unnecessary steps and organize their solutions in the most efficient manner.
- (2) Students have been taught to find mistakes and to consider the usefulness of problems.
- (3) Factors resident in the school and the teacher do affect, to varying degrees, the efficiency of the class.

#### Recommendations

The preparation of mathematics teachers should be strengthened so that the accepted goals of first year algebra, as set forth in this study, will be attained by more students. 131 pages. \$1.64. MicA 55-2089

\*Defined for this study as non-tax supported, but exclusive of military and church related schools.

#### A STUDY OF THE OUTCOMES TEACHERS FELT CHILDREN GAINED FROM THE USE OF CONSTRUCTION ACTIVITIES IN SELECTED ELEMENTARY SCHOOLS IN THE STATE OF MISSISSIPPI

(Publication No. 13,230)

August Wayne Scrivner, Ed.D.  
Indiana University, 1955

#### The Problem

The primary purpose of this study was to determine the educational outcomes which teachers felt children gained through the use of construction activities in selected elementary schools in the state of Mississippi. The following subproblems were involved: (1) to determine the characteristics of good construction activities in the elementary school as described in educational literature; (2) to identify, from the research and literature, the educational outcomes normally derived from the use of good construction activities in the elementary school; and (3) to consider the extent to which teachers involved in this study agreed with educational authorities in regard to the educational outcomes normally derived from the use of construction activities.

#### Procedures Used in the Study

The following procedures were used in completing the study:

1. A survey was made of the literature dealing with construction activities in the elementary schools to ascertain the nature and extent of research in this field.
2. A survey was made of the relevant educational literature and research to establish the characteristics of good construction activities in the elementary school.
3. A survey was made of the available educational literature and research to determine the educational outcomes normally derived from the use of good construction activities in the elementary school.
4. An appraisal instrument was developed for the purpose of determining the educational outcomes that elementary school teachers felt children gain from the use of construction activities.
5. A pilot study using teachers attending summer school at the University of Mississippi was conducted for the purpose of discovering weaknesses in and improving the instrument.
6. Elementary schools in the state of Mississippi were selected for use in the study according to certain criteria, and permission to conduct the study was obtained from the superintendents of these schools.
7. Assistance in conducting the study was obtained from the art supervisors in the respective schools.
8. An appraisal of the use of construction activities in the selected elementary schools was made by administering the instrument to each teacher in the school.
9. The results of the appraisal were validated through personal interviews and observations, using an investigator's check list.
10. Conclusions were drawn on the basis of the findings.



## Conclusions

On the basis of the findings outlined above, it is possible to draw the following conclusions concerning construction activities in selected schools in the state of Mississippi.

1. In general, construction activities involving representative objects are used more to enrich pupils' learning than are those involving functional articles or authentic objects.
2. The children are learning skills to a limited degree and gaining some broader educational outcomes by participating in construction activities.
3. The amount of time spent by the children in construction activities is related to the extent of enrichment of their learning experiences.
4. The extent of use of construction activities seems to be inversely related to the classroom enrollment.

5. The extent of provisions for basic requirements for conducting construction activities has a direct, beneficial influence on the amount of profitable learning gained from these experiences.

6. More educational outcomes are provided the children through the use of construction activities if the teachers have more training in the area, more materials, tools and equipment, more classroom time, and smaller class enrollments.

7. Children attending selected schools in the state of Mississippi spend a relatively small percentage of their school time engaging in construction activities.

8. A noticeable lack of agreement existed between the teachers and educational authorities in regard to the use of construction activities.

149 pages. \$1.86. MicA 55-2090

## ENGINEERING

### ENGINEERING, AERONAUTICAL

#### SUPERSONIC FLOW ABOUT POINTED BODIES

(Publication No. 13,333)

Bernard Mathew Leadon, Ph.D.  
University of Minnesota, 1955

An investigation has been made into the approximate solution of problems of inviscid, supersonic flow about smooth, elongated, pointed bodies of general cross section shape. For simplicity this study deals principally with bodies whose axes are aligned with the free stream, but sufficient consideration to indicate the technique is given to slightly inclined bodies as well.

It is found that an iteration process, using the limiting solution for very slender bodies as the first step, can be successfully applied to smooth, pointed bodies of quite general cross section shape to obtain an arbitrarily accurate series approximation to the desired perturbation potential. The method may be applied either to the first order (linearized) or to the second order problem. The resulting series converges so rapidly that usually only a few steps in the process are required to obtain accuracy consistent with the assumption of isentropic flow. The method correlates the results of a number of earlier theories which were suitable for particular body shapes, and it also extends the possibility of accurate calculation to a much larger class of bodies.

When the body has a constant cross section shape, the limiting solution is shown to be obtainable by analytic transformation from that for the equivalent body of revolution.

For axial flow about a circular cone it is shown that the iteration process gives the series expansion of the exact first order solution of von Karman and Moore.

The first order solution for axial flow about any smooth, pointed body of revolution is readily provided by this method, a solution given earlier by von Karman and Moore, Lighthill, Ferrari, and others by other methods.

Applied to the second order problem for axial flow about a circular cone it is shown that two steps of the process give Broderick's solution but for a (linear) function of the axial coordinate. Carried through additional steps the method would rapidly approximate Van Dyke's exact order solution but for similar arbitrary functions.

The second order solution for flow about any smooth, pointed body of general cross section shape is determinable by this method to within a linear function of the axial coordinate which is always provided by comparison with the circular cone solution.

The first order problem for axial flow about an elliptical cone and the second order problem for the same body are solved approximately by two iterative steps for the purpose of demonstrating an application to a particular flow not having axial symmetry. A comparison of these new elliptical cone results with those of previous linear-

ized methods indicates superior accuracy in the present second order theory.

The cross flow solutions for slightly inclined bodies of revolution are also derived for both the first order and the second order approximations, the latter not having been accomplished heretofore.

73 pages. \$1.00. MicA 55-2091

### ENGINEERING, AGRICULTURAL

#### DEPOSITION OF AERIAL SUSPENSIONS OF PESTICIDES

(Publication No. 12,957)

William Eldon Splinter, Ph.D.  
Michigan State University, 1955

Present-day methods of application of pesticides as dusts, sprays, or fogs, are very inefficient. The basic problem to which this work was devoted was the increase in efficiency of deposition and uniformity of coverage of plant surfaces by insecticides and fungicides for plant protection. The specific phases investigated were; the influence of particle sizes on the effectiveness of an insecticide or a fungicide, and the various forces affecting deposition and their relative importance in deposition.

A review of experimental results obtained by entomologists and plant physiologists was carried out and an analysis of the effect of particle size and application rate on effectiveness of control of insecticides and fungicides was correlated with these experimental findings.

A series of experiments were run under controlled laboratory conditions to quantify the effects of gravitational, inertial, and electrical forces on dusts of different density and particle size. The effects of these forces on dust deposition were measured at three relative humidities. The effects of inertial forces were investigated at four air velocities. An additional experiment was conducted to determine the magnitude of friction charging of dust.

Field tests on plots of onions and celery were conducted to compare the effectiveness of plant disease control of commercial and micronized dusts at various rates per acre, both charged and uncharged.

From the review of literature it was found that, in many cases, reduction in particle size of pesticidal dusts increases their effectiveness against insects and fungi. Equations were derived with which it is believed the effect of changes in application rate and particle size on control of plant diseases and insects can be calculated.

The effects of the various forces on deposition of fine particles were compared on the basis that particle



terminal velocity in any given force field could be used as a criterion of deposition rate. Analysis indicated that the rate of fall of particles below five microns in a gravitational force field would be so small that drifting in the air currents would be excessive. The rate of deposit due to inertial forces was found theoretically and experimentally to increase linearly with air velocity for laminar conditions of flow. For turbulent flow conditions, analysis indicated that increase in air velocity would not give further increase in deposit at higher air velocities. Analysis indicated that inertial forces would be of little value for very small particles.

Plant surfaces may be as high as 20°C. above ambient air temperature in direct sunlight. Thermal forces, though of small magnitude, may decrease deposit of very small particles through thermal repulsion.

Frictional charging was found to increase with particle weight. Analysis indicated that deposition rate due to friction charging would increase with particle size.

Charging of particles by an ionized field was found to increase with particle surface area. Deposition rate due to charging in an ionized field was found analytically and experimentally to be independent of particle size.

Of the forces considered, only those due to electrical field forces caused by particles charged in an ionized field were found to be of potential importance toward effective deposition of fine particles.

180 pages. \$2.25. MicA 55-2092

## ENGINEERING, CHEMICAL

### SEMICHEMICAL PULPS BY CONTINUOUS METHODS

(Publication No. 12,771)

Marshall E. Findley, Ph.D.  
The University of Florida, 1955

An investigation was carried out on the yields and chemical properties of pulps obtained in neutral sulfite semichemical pulping under simulated continuous conditions. The temperature and concentration of the cooking liquor were held essentially constant throughout each cook. These conditions simulated continuous methods, and allowed a thorough study of the effects of the variables. Various chip sizes and conditioning were studied. However, air dry chips, which had been previously shredded while green with the Jackson and Church "015" refiner, were used in the major part of the investigation. A few cooks were made on green chips, air dry mill chips, and on a hay-like fibrous wood produced by slight cooking and refining. Pulps were analyzed for lignin, pentosan, holo-cellulose, and alpha-cellulose. The concentrations studied ranged from 5 to 75 g/L  $\text{Na}_2\text{SO}_3$ , calculated as  $\text{Na}_2\text{O}$ . Cooking temperatures varied from 162 to 186°C. Yields from about 50 to 85% were obtained.

It was found that the removal of the wood components varied linearly with wood removal over the range of yields studied. The ratio of lignin removal to wood removal was greatest for green chips and smallest for air

dry mill chips.

It was found that with increases of concentration above 15 g/L of  $\text{Na}_2\text{SO}_3$ , expressed as  $\text{Na}_2\text{O}$ , there is very little increase in cooking rate. The relationship between yields and time for air dry chips is approximated by an equation assuming two simultaneous or consecutive reactions involving two different types or states of undissolved wood. Each of these reactions can be assumed to be first-order in the calculations. The reaction velocity constants determined were found to vary according to the Arrhenius equation with activation energies comparable to values in the literature for other cooking methods. It was found that green chips cooked appreciably slower than air dry chips.

An empirical relationship was found relating linearly the logarithm of time with pulp yield. This relationship permits a simplified method for estimating yields.

119 pages. \$1.49. MicA 55-2093

### DRYING AIR WITH ACTIVATED ALUMINA UNDER ADIABATIC CONDITIONS

(Publication No. 12,798)

Robert John Getty, Sc.D.  
Washington University, 1955

Chairman: Lawrence E. Stout

An investigation was made of the main variables affecting the frying of air-water vapor mixtures by means of a fixed bed of Grade F-1 Activated Alumina, 1/4 inch to 8 mesh, under adiabatic conditions of operation. All work was carried out at atmospheric pressure. The variables selected for study were bed depth, air flow rate, temperature, and inlet moisture content. Statistical methods were employed to plan the experiments and analyze the results. It was found that time of operation below a 0°F. effluent dew point could be accurately predicted on the basis of the four variables studied.

Temperatures throughout the bed were recorded during each of the runs, and aided in the analysis of the sorption mechanism. It was found that two separate "waves" or "fronts" move through the bed during a sorption run; one, the temperature wave and the other the zone of active sorption. The rates of movement of these two waves through the bed were found to completely define the break-points of the resultant sorption curves.

179 pages. \$2.24. MicA 55-2094

# THE UTILIZATION AND MECHANICAL SEPARATION OF SUGAR CANE BAGASSE

(Publication No. 12,522)

Robert Marius Hansen, Ph.D.  
Louisiana State University, 1955

Supervisor: Professor Arthur G. Keller

During the past 100 years, numerous schemes for the utilization of bagasse have been proposed. Only a few uses, other than as fuel, have proven economically sound and a few sugar mills can usually supply the bagasse required for these. One of the potential uses which might consume the tremendous quantity of bagasse that is available throughout the world, is the paper and the wall board industries. Many investigators are agreed that to make a high quality paper from bagasse, it is essential that the juice bearing cells, pith, and some of the dirt be removed from the bagasse fiber.

Many processes, both chemical and mechanical, have been suggested for separating the pith from the fiber. The chemical methods were generally too costly and many of the mechanical ones inefficient. After a review indicated that the mechanical separation method appeared to offer the best possibilities, research was started on this subject at Louisiana State University, in 1945.

Preliminary investigations using a specially designed swing hammer mill in conjunction with a flotation tank showed that a fiber product relatively clean and free of pith could be obtained. The next step was the construction of a semi-commercial size pilot plant. It was soon discovered that the flotation tanks were not necessary and the plant was then remodeled into a more compact unit composed of three swing hammer mills.

In this separation plant, the bagasse passes across the top of the hammers in each of three mills. A portion of the pith is forced apart from the fiber in each mill and passes through a screen which is located directly beneath the hammers. The heads of the mills are designed so that water or steam may be injected into the bagasse as it progresses through the mills.

Runs were made on the more compact unit from the 1950 grinding season through the 1954 season during which time improvements were made until the plant will now handle over 2 tons of raw bagasse per hour at maximum capacity. Most of the data included in this report are from the '52 to '54 seasons during which time the author worked with the Separation Plant.

It was determined that the wet separation was better than the dry, but more problems are encountered in handling and storing the wet fiber and pith. The amount of separation obtained and power consumed were determined as a function of the number of mills used, feed rate, the mill screen size, rotary speed, and wet or dry separation. The power consumption per unit of product was improved considerably if only two mills were used and a high feed rate maintained. The best fiber product is obtained with large screens and a maximum water rate, and the poorest with small screens and no water. Since various products require different amounts of separation, conditions may be chosen anywhere between these extremes.

The evaluation of the fiber product as a raw material for paper shows that it is vastly superior to normal bagasse and that the wet separated fiber is better than the

dry for a quality product. The wet separated fiber requires very little additional refining for wallboard production. 207 pages. \$2.59. MicA 55-2095

# PHYSICAL AND THERMODYNAMIC PROPERTIES OF TRIFLUOROMETHANE

(Publication No. 12,589)

Yu-Chun Hou, Ph.D.  
University of Michigan, 1955

The physical properties, including vapor pressure, saturated liquid density, PVT behavior and specific heat at zero pressure, have been determined for trifluoromethane. These are the properties necessary for the evaluation of the thermodynamic functions of entropy and enthalpy which are important in designing refrigeration units which use trifluoromethane.

The vapor pressure of the saturated liquid at a given temperature was measured by the static method using a mercury manometer for pressures below 1-1/2 atmospheres and pressure gages of suitable range for pressures above 1-1/2 atmospheres. The temperature was measured with a platinum resistance thermometer.

The saturated liquid density was measured by determining the temperature at which the density of the saturated liquid matches that of a pre-calibrated density float. The liquid and the float were placed in a sealed, thick-walled, Pyrex glass tube and the temperature adjusted to cause the float to rise or fall. The same sealed glass tube was used for critical temperature determination by finding the average of the temperatures at which the meniscus disappeared and reappeared. The value of critical pressure was obtained by extrapolation of vapor pressure data. The critical volume was estimated by the method of rectilinear diameter.

The pressure-volume-temperature behavior was measured by confining a certain amount of trifluoromethane in a constant-volume density bulb and measuring the pressure in the system at given temperatures.

The specific heat was calculated, from the reported spectroscopic data on vibrational frequencies in the literature, by the method derived from statistical mechanics. Anharmonicity corrections were estimated to be 0.75% at 800°R and 0.30% at 250°R. The ranges of these determinations were as follows:

1. Vapor pressure measured from 254°R to 537°R which is equivalent to a pressure range of 0.25 to 690 lb./sq. in. absolute.
2. Saturated liquid densities measured from 370°R to 538°R.
3. Pressure-volume-temperature behavior measured from 400°R to 710°R in temperature, 1 lb./cu.ft. to 60 lb./cu.ft. in density and 50 lb./sq.in. to 2000 lb./sq.in. absolute pressure.
4. The critical conditions observed at 538.33°R + 0.05° with the estimated critical pressure of 701.4 lb./sq. in. + 3 absolute and critical density of 32.78 lb./cu.ft. + 0.3.
5. The specific heat at zero pressure from 250°R to 800°R.

The precision of temperature measurement was



within 0.05° F and that of pressure measurement was about 0.3% overall range. The error in measuring the saturated liquid density was about 0.1%. The error in specific volume in pressure-volume-temperature measurement was probably 0.5%. The specific heat, at zero pressure, as obtained from spectroscopic data is probably within about 0.5%.

In representing the data with empirical equations, the theoretical aspects and the practical applicability, with maximum precision obtainable, which influence the selection of these equations have been studied. The empirical equations, which represent the data within the estimated experimental precision, for vapor pressure, saturated liquid density, pressure-volume-temperature and specific heat at zero pressure, respectively, are presented. These equations appear to be the best compromise between simplicity and precision. The information summarized in these analytical forms is ready for the evaluation of the desired thermodynamic functions, which can conveniently be carried out by a calculating machine, and for the design calculations of a refrigeration unit.

122 pages. \$1.53. MicA 55-2096

#### RATES OF CONDENSATION OF ACETONE TO MESITYL OXIDE IN CATION-EXCHANGE RESINS

(Publication No. 12,600)

Frank Gustav Klein, Ph.D.  
University of Michigan, 1955

The purpose of this investigation was to determine the variables affecting the rate of condensation of acetone to mesityl oxide, catalyzed by a cation-exchange resin in the hydrogen form. The reaction was carried out in a flow reactor using fixed beds of a sulfonated polystyrene divinylbenzene copolymer (Dowex 50-X8) under steady-state conditions.

The experimental variables studied were:

Temperature: 30, 45, 60, 75°C

Resin bead sizes: 20-25, 30-35, 120-140 U.S.  
Standard Mesh

Equivalents of hydrogen ion in the catalyst bed:  
up to 0.3602

Space velocities: 0.00417 to 0.0761 liters/ (min.)  
(equiv.)

Reactor Feed: Acetone with less than 0.20 weight %  
water (also some runs with diacetone alcohol as feed)

The major products of the reaction under the above operating conditions were: mesityl oxide, water, and some diacetone alcohol. A maximum of about 18% of the acetone was converted, with 16.1% of the acetone going to mesityl oxide and water, and the rest to diacetone alcohol. Some polymeric materials were also formed. During the maximum time of operation of the reactor, about 150 hours, there was no noticeable deactivation of the catalyst, though the particles grew in size and became totally black. Reactor feeds consisting of diacetone alcohol yielded mesityl oxide and water only; no acetone was formed.

A rate equation was determined to correlate conversion data for acetone containing less than 0.20 weight % water,

or the proper stoichiometric ratio of mesityl oxide to water. The rate of formation of mesityl oxide is:

$$\frac{d(\text{MO})}{d(N/F_V)} = \frac{k_1 \phi (K_c(\text{Ac})^2 (\text{MO})(\text{H}_2\text{O}))}{1 + k_2(\text{MO})(\text{H}_2\text{O})}$$

$$k_1 = 6.91(10)^4 \exp(-5330/T)$$

$$k_2 = 2.24(10)^{-8} \exp(6720/T)$$

$$K_c = 6.20(10)^{-3} \exp(347/T)$$

$$\phi = \frac{.0426}{R} \left( \coth \frac{R}{.0142} - \frac{.0142}{R} \right)$$

MO, H<sub>2</sub>O, and Ac are concentrations of mesityl oxide, water, and acetone in moles/liter respectively.

N/F<sub>V</sub> is space velocity in liters/(minute) (equivalent)  
(liters)<sup>2</sup>

k<sub>1</sub> is a rate constant in  $\frac{(\text{mole})(\text{equiv.})(\text{minute})}{(\text{mole})(\text{equiv.})(\text{minute})}$

k<sub>2</sub> is a constant in (liters/mole)<sup>2</sup>

φ is a resin efficiency function, which in this case is dependent on resin radius only

T is temperature in °Kelvin

R is the radius of the catalyst in the acetone-swollen state, in cms.

K<sub>c</sub> is the reaction equilibrium constant

The acetone concentration term neglects any diacetone alcohol formed. No correlation was obtained for the rate of formation of diacetone alcohol because the conversion data were too scattered to be usable. The maximum conversion to diacetone alcohol was about 4% of the acetone feed.

An attempt was made to calculate diffusivities of the reactants and products in the catalyst phase by studying the swelling rate of the resin immersed in liquid under a microscope. A ring which apparently is the boundary between liquid-saturated and liquid-free catalyst was seen to advance toward the center of the resin sphere during the diffusion. From this it was calculated that the resin-phase diffusivity varied appreciably during the unsteady-state diffusion process.

149 pages. \$1.86. MicA 55-2097

#### THE DEVELOPMENT OF A THERMODYNAMIC NETWORK FROM P-V-T DATA WITH SPECIFIC APPLICATION TO TERTIARY BUTYL ALCOHOL

(Publication No. 12,804)

Lester Herman Krone, Jr., Sc.D.  
Washington University, 1955

Chairman: R. Curtis Johnson

Using C<sub>p</sub> values from the literature and experimentally determined vapor pressure-temperature and pressure-volume-temperature relationships, a thermodynamic network has been established for tertiary butyl alcohol in the range 78 to 500° F and 14.7 to 700 psia. The results include tabulated values of p, v, T, H, S, f, and Z, as well as the vapor pressure-temperature curve

the critical properties, and constants for the Beattie-Bridgeman equation.

The original pressure data were accurate to within 0.14 percent in the high range and to within 4 percent in the low range. The limits on the experimental volume data were 0.07 percent for large vapor volumes and 2 percent for liquid volumes. The temperatures were determined to within 0.1°F, or less than 0.02 percent of the absolute temperature.

Experimentally determined vapor pressures were found to be lower than those reported in the literature in the range above one atmosphere. Values previously reported were obtained by extrapolation of a vapor pressure equation developed for use at sub-atmospheric pressures. For pressures below one atmosphere, the experimental values agreed with the reported values.

133 pages. \$1.66. MicA 55-2098

### LIQUID-VAPOR EQUILIBRIA OF THE SYSTEM BROMINE PENTAFLUORIDE- BROMINE TRIFLUORIDE

(Publication No. 12,609)

Ray Derward Long, Ph.D.  
University of Michigan, 1955

The liquid-vapor equilibria for the system bromine pentafluoride-bromine trifluoride have been measured and correlated. The measurements were made in a welded nickel Othmer still. Temperatures were measured with a calibrated platinum resistance thermometer. Pressures were measured with a metal steam ebulliometer in conjunction with the temperature measuring equipment and the known vapor pressure-temperature relation for water.

Isothermal diagrams at 50, 75, 100, 125 and 150°C and an isobaric diagram at 1 atmosphere have been measured. At higher temperatures, pressures become excessive and bromine trifluoride tends to decompose. It is felt that the smoothed data can be safely extrapolated to 25°C so that the complete 1 atmosphere diagram can be calculated and compared with the experimental isobar.

The five isotherms are each fitted with the two-constant thermo-dynamically consistent van Laar equations.

$$\log_{10} \gamma_1 = A/(1 + Ax_1/Bx_2)^2, \text{ and}$$

$$\log_{10} \gamma_2 = B/(1 + Bx_2/Ax_1)^2.$$

Ideal behavior of the vapor phase is assumed for the purpose of calculating activity coefficients, and the subscripts 1 and 2 refer to bromine penta-fluoride and bromine trifluoride, respectively. The constants A and B of the van Laar equations represent the logarithm of the activity coefficients at infinite dilution of bromine penta-fluoride and bromine trifluoride, respectively. They are fitted as a function of temperature by the following equations,

$$A = 0.1290 + 0.001076t, \text{ and}$$

$$B = 0.4000 + 0.001000t.$$

The vapor pressures of the pure components were also measured over the same temperature range and are represented by the equation,

$$\log_{10} P = 6.4545 + 0.001101t - 895/(t + 206),$$

for bromine pentafluoride and by the equation,

$$\log_{10} P = 7.65757 - 1627.5/(t + 215)$$

for bromine trifluoride, where P is in mm, and t is in °C. With the aid of the above correlation, isotherms and isobars are calculated at even temperature and pressures.

The critical constants are estimated to be 486 and 612°K and 47 and 69 atmospheres pressure, respectively, for bromine pentafluoride and bromine trifluoride. These values are used in conjunction with the low-pressure form of the Berthelot equation of state to calculate saturated gas volumes. Entropies and enthalpies of vaporization are calculated from the Clausius-Clapeyron equation with the aid of the slopes of the vapor pressure equations and the calculated saturated gas volumes.

The entropies of vaporization for bromine pentafluoride and bromine trifluoride are compared with the value for "normal" liquids. Bromine pentafluoride is found to exhibit a slightly greater entropy of vaporization than is expected for a normal liquid and bromine trifluoride shows considerable excess entropy of vaporization.

The experimentally determined data on the liquid-vapor equilibria of the system bromine pentafluoride-bromine trifluoride were compared with the liquid-vapor equilibria behavior predicted by the "regular solution theory." The theoretically predicted behavior was found to offer a very poor approximation and the reason for this is not completely clear. In the treatment of the regular solution theory that was used, no attempt was made to account for specific interactions. The excess entropy of vaporization that is found for bromine trifluoride suggests that there is considerable association in the condensed phase. This effect would be expected to carry over into solutions in which bromine trifluoride is a component. The regular solution theory predicts large positive deviations and consequently two immiscible liquid phases. The much smaller deviation from ideality that is actually observed and the failure of the system to exhibit immiscible liquid phases might be explained by a specific interaction of unlike molecules in the solution.

132 pages. \$1.65. MicA 55-2099

### ENGINEERING, CIVIL

#### ANALYSIS OF INTERCONNECTED GIRDERS AND GRILLAGE BEAMS

(Publication No. 13,077)

Beverly James Covington, Ph.D.  
Northwestern University, 1955

Supervisor: Kiklos Hetényi

The grid structure considered in this study is comprised of parallel girders, simply supported at their ends, and parallel transverse crossbeams. This dissertation was undertaken for the purpose of obtaining



solutions for structures with more than four girders, and to include the effect of the torsional resistance of the system, which has usually been neglected in previous studies.

For a grillage with rigid connections at points of intersection of the beams, an arbitrary loading produces a deflection, and a rotation of each member about its longitudinal axis.

A method of analysis is first developed for a grillage with girders of infinite torsional rigidity.

Treated under the heading of grillage beams are structures for which the crossbeams are assumed to be resting on elastic supports provided by the girders; the interaction between a crossbeam and a girder at a point of intersection is assumed to be a vertical force only.

The effect of the torsional rigidity of girders and crossbeams is included in the analysis of the last grillage studied.

In this study, the crossbeams are assumed to be sufficiently closely spaced such that their action can be approximated by a continuous elastic system of equivalent stiffness. The deflections and rotations of the girders are expressed by sine series, and the strain energy of the system is expressed in terms of the deflections, slopes, and rotations of the girders. The coefficients of the sine series are obtained by use of the principle of virtual displacements.

The solutions for the deflections of the girders are in the form of rapidly converging series, and only a few terms are necessary for practical calculations. The rapid convergence of the solutions for deflections is particularly advantageous for the analysis of grid structures with girders continuous over intermediate supports.

The solutions obtained by the method of this dissertation are discussed in connection with some related problems, and numerical examples are given for comparison with other methods and test data.

73 pages. \$1.00. MicA 55-2100

## ENGINEERING, ELECTRICAL

### CURVED-WALL ELECTROMAGNETIC HORNS

(Publication No. 13,081)

Donald Alfred Dobson, Ph.D.  
Northwestern University, 1955

Supervisor: Robert E. Beam

An investigation of curved-wall electromagnetic horns is given. The discussion is restricted to E- and H-plane horns mounted on rectangular waveguide in which only the  $TE_{10}$  mode can propagate. No particular shape for the flaring horn walls is assumed.

In the theoretical portion of the investigation the problem is first reduced to a two-dimensional scalar problem. The unknown scalar function is then expanded in a characteristic function (eigenfunction) expansion very similar to a Fourier series expansion. The characteristic functions are known functions of the flaring dimension of the cross section. The amplitude factors multiplying the charac-

teristic functions are unknown functions of axial distance. Differential equations for these amplitude factors are obtained and are solved approximately by the WKBJ method assuming the horn is infinitely long in the axial direction.

The input impedance of E- and H-plane horns of infinite length are obtained from the solutions of the theoretical problem. The impedance match to the waveguide is best when the slope of the horn walls at the throat of the horn and the rate of change of the slope with axial distance at the throat are zero. A radiation pattern is calculated by assuming that the field at the mouth of a finite horn is the same as the field at that cross section in an infinitely-long horn. Currents flowing on the outside of the horn are neglected for this radiation pattern calculation.

Experiments were performed to test the reliability of the theoretical calculations. During one portion of the experimental work a parallel-plate region was used in which the field within the plates could be probed through holes in one of the plates. This device was used to measure the field within a long horn whose cross-sectional dimension was a hyperbolic cosine function of the axial distance. It was found that when the horn became fairly large in cross section (six wavelengths) and the slope of the walls began to increase rapidly, the waves seemed to break away and radiate from the horn, the waves not being affected much by the horn walls beyond that point.

Free-space radiation patterns were measured for several H-plane horns whose cross-sectional dimension varied as the hyperbolic cosine function of axial distance. The agreement between the radiation patterns obtained experimentally and theoretically for a horn with a three-wavelength aperture is good. All of the measured 10-db beamwidths were around 50 degrees or larger. No measurements were made for aperture sizes greater than five wavelengths. The hyperbolic cosine horns have only slightly smaller standing-wave ratios than sectoral horns due to the fact that most of the reflection comes from the mouth rather than the throat of the horns.

One of the results of the investigation is that the impedance mismatch at the throat of the horn is reduced if the slope of the horn wall is made zero at the throat and if in addition, for E-plane horns, the rate of change of the horn wall slope is made small. For small beamwidths one should use a sectoral horn with a curved transition section between the horn and waveguide. Sometimes the curved transition section may be undesirable since the discontinuity at the throat of a sectoral horn may partially compensate for the reflection from the mouth of the horn. Horns whose walls flare in a manner similar to the hyperbolic cosine function tend to have a large phase error at the mouth due to the rapidly flaring walls. 193 pages. \$2.41. MicA 55-2101

# EXTRACTION OF SPEECH INFORMATION CONTENT AND ITS APPLICATION TO EFFICIENT CODING

(Publication No. 13,086)

Richard A. Gibby, Ph.D.  
Northwestern University, 1955

Supervisor: Robert E. Beam

In this study speech signals and the methods of their production were examined in terms of Information Theory concepts. The information content and the redundancy of speech were evaluated. Several elements in speech signals may be associated with the intelligibility conveyed in the speaking process. These elements are much simpler in form than the rapid fluctuation of speech waves. The problem of reducing the speech signal to its minimum essential elements was considered. Certain components called formants were indicated and their relationship to speech signals were discussed. An analysis of the electrical analog of the vocal tract for nine separate vowel sounds was made. This analysis gave a reliable basis for the production of the first three formant regions in the spectrum of the speech sounds considered.

Two possible methods of reducing the speech signal to its essential elements were examined in detail. The first method was by means of a predictive-coding technique. This method proved to have possible application to the efficient coding of speech; however, the complications which result from implementing such a system proved to be prohibitive. For this reason no experimental investigation was made for this coding system.

The second method consisted of the detection of the formants in speech signals. A formant tracing system was designed and built, and its performance was evaluated. In this system a speech formant was isolated by a narrow-band filter with variable tuning. An output voltage was produced which was proportional to the formant frequency. This voltage was then used as a means of controlling the tuning of the filter.

The first two formants of speech were detected and recorded, producing a time-frequency pattern similar to visible speech. Another type of visible speech presentation was also made in which time was eliminated as an independent variable by portraying the first formant versus the second. Examples of representative patterns of speech formed in this manner were produced by the sounds made in speaking the ten digits. All plots of this type were distinct and easily identifiable. Patterns formed by most phonetic sounds were easy to recognize.

The signals which resulted from the formant detection process were reduced in frequency content by a factor of over one hundred; however, these signals still contained the majority of the information of the original speech signal. Application of signals produced by this method to speech communication systems, voice control systems, and visible speech work were discussed.

116 pages. \$1.45. MicA 55-2102

# MATRICES IN ANALOGUE COMPUTERS

(Publication No. 12,799)

Robert Edwin Horn, Sc.D.  
Washington University, 1955

Chairman: R. W. J. Koopman

The application of matrices to the analysis and synthesis problems in electronic analogue computers results in a fundamental approach which does not require the artifices of conventional practice. By establishing a mathematically-sound basis for the electric network equations, extensions in the scope of analogue computers are indicated. In addition, through the systematic approach inherent in the matrix notation itself, a number of practical advantages in computer operation are achieved. The research is restricted to consideration of ordinary linear differential equations with constant coefficients, and linear algebraic systems.

197 pages. \$2.46. MicA 55-2103

# A PHASE SPACE METHOD FOR THE SYNTHESIS OF NON-LINEAR SERVOMECHANISMS

(Publication No. 12,602)

Richard Edward Kuba, Ph.D.  
University of Michigan, 1955

The purpose of this study is to evolve a process for the synthesis of non-linear servomechanisms whose behavior, when stimulated by step inputs of position, approaches as closely as desired to the behavior of the optimum contactor servomechanism of the same order.

The synthesis procedure presented begins with the selection of a phase trajectory in a phase space whose coordinates are system error and derivatives of system error. Using, as a guide, the phase trajectory of the optimum contactor servomechanism for a step input of position, a non-linear differential equation describing the system behavior is synthesized which is closely related to the differential equation for the linear system of equal order and is characterized by coefficients containing the design parameters of maximum system initial error and maximum system response time. The synthesized, non-linear differential equation has the mathematical form-

$$\frac{d^n E}{dt^n} + h(E) \frac{d^{n-1} E}{dt^{n-1}} + b_{n-2} \frac{d^{n-2} E}{dt^{n-2}} + \dots + b_1 \frac{dE}{dt} + b_0 E = 0$$

where; E represents the control system error function,  $b_0, b_1, b_2, \dots, b_{n-2}$  are real constants, and n is a positive integer greater than one. Theorems are proposed which place sufficient conditions on a phase trajectory so that the synthesis procedure will uniquely determine the coefficients  $b_0, b_1, b_2, \dots, b_{n-2}$  and the function h(E).

The synthesis procedure is carried through to completion for non-linear servomechanisms of order two, three and four. The results of an analog computer study, made to determine the response characteristics of these synthesized, non-linear control systems when



the function  $h(E)$  is approximated by a simple curve, show good agreement with the theoretically predicted response. Moreover, a model, non-linear, second order servomechanism is constructed and tested to substantiate the theory. The step input of position response of the non-linear, model servomechanism is shown to be superior to the step input of position response of an equivalent, linear model servomechanism.

The general conclusions are: 1) A synthesis procedure can be evolved which begins with a phase trajectory and terminates with a non-linear differential equation describing the behavior of a stable, physically realizable, non-linear servomechanism. 2) The synthesized non-linear system's response for step inputs of position is superior to the equivalent linear system's response and may be allowed to approach as closely as desired to the step input of position response of the optimum contactor servomechanism of the same order. 3) Time solutions of the synthesized, non-linear differential equations are obtained in a number of important cases.

228 pages. \$2.85. MicA 55-2104

#### APERTURE CORRECTION FOR INSTRUMENTATION SYSTEMS

(Publication No. 12,633)

Joseph Otterman, Ph.D.  
University of Michigan, 1955

The purpose of this study is to investigate a problem in electrical instrumentation: the compensation by a network for an averaging effect common to a large variety of sensing devices, i.e., devices that convert a signal in one form of energy into a signal in another form of energy. A well known example is an instrumentation system that converts spot-by-spot light intensity in a picture into a continuous electric signal by aperture scanning. The distortion involved is hence known as the aperture effect. For scanning at a uniform rate by a rectangular aperture the transfer function relating the output and the input of the device in terms of the complex frequency  $p$  is  $f(p) = h \frac{1 - e^{-ap}}{p}$  where  $h$  expresses the sensitivity and " $a$ " is the time the scanner takes to scan a distance equal to the length of its aperture.

The circuits described in this dissertation represent a new approach to the problem of compensation. The transfer functions of the circuits suggested are inverse to those of the apertures, except for small departures introduced to ensure stability or caused by losses in delay lines. The common property of all these circuits is that they incorporate a delay device in the feedback loop of an active element or a delay line mismatched at both ends. The impulse responses possess some repetitive character.

The suggested method of achieving compensation seems to be of greatest importance when the smallest technically feasible aperture does not offer the required systematic accuracy. Even if the length of the aperture is greater than  $\frac{2\pi}{\omega_s}$  where  $\omega_s$  is the limiting frequency of the input spectrum, the corrective network can recover most of the original information from the distorted signal available at

the output of the aperture.

Moreover, the compensation discussed will be found very useful in the case where the input spectrum is spread over relatively large frequency band  $0 < \omega < \omega_s$  and where high accuracy is required up to the limiting frequency  $\omega_s$ . In such a case a system consisting of a sensing device only cannot offer an acceptable solution because the noise to signal ratio is large when the aperture is small enough not to cause large distortion. In a system consisting of an aperture, an amplifier and a corrective network, the aperture size can be chosen in such a way as to minimize the noise to signal ratio. The length of such an aperture depends on the nature of noise and on the noise-minimization criterion, but it will be

generally found ranging from  $0.75 \frac{\pi}{\omega_s}$  to  $1.35 \frac{\pi}{\omega_s}$ . The amplifier after the aperture serves to lift the signal level well above the level of additional noise introduced in the corrective network. The compensation in the corrective network itself provides then the systematic accuracy required.

The compensating method offers special advantages when some preferred forms of the aperture, such as the birectangular or exponential, can be used. The transfer function of the exponential aperture has the form

$h \frac{1 - e^{-au}e^{-ap}}{p + u}$  where  $u > 0$ . This transfer function does not

have any zeros on the  $i\omega$  axis or in the right half-plane. Thus the exact inverse transfer function corresponds to a stable network. In this respect the exponential aperture differs from the other apertures discussed, which all exhibit zeros of the transfer function on the  $i\omega$  axis.

As part of this investigation, differentiation by a condenser-resistor network and differentiation by a delay line are analyzed and compared. A prerequisite for carrying out the comparison is established; the origin of time of impulse responses in both cases is chosen in such a way as to eliminate the first error term in the transfer function expansion in powers of  $\omega$ .

103 pages. \$1.29. MicA 55-2105

#### A LARGE-SIGNAL ANALYSIS OF THE TRAVELING-WAVE AMPLIFIER

(Publication No. 12,638)

Joseph Everett Rowe, Ph.D.  
University of Michigan, 1955

It is the purpose of this dissertation to derive the large-signal traveling-wave amplifier equations, to outline a method by which these equations may be solved on a high-speed digital computer, and to present the resulting equations in such form that the information will lead to a fuller understanding of the physical phenomena involved in the high-level operation of the traveling-wave amplifier.

Equations are derived describing the large-signal operation of the traveling-wave amplifier, including the effects of a-c space charge and attenuation along the helical slow-wave structure. The equations constitute a system of nonlinear partial-differential-integral equations and are valid for all values of the parameters which

are encountered in typical high-power traveling-wave amplifiers. The parameters which appear in the equations are the relative injection velocity  $b$ , the gain parameter  $C$ , the large-signal space-charge parameters  $K$  and  $B$ , the loss parameter  $d$ , and the input-signal level  $A_0$ .

The working equations were programmed for and solved on the Michigan Digital Automatic Computer, MIDAC, located at the University of Michigan's Willow Run Research Center. The r-f voltage amplitude  $A(y)$ , the phase lag of the r-f wave relative to the electron stream  $\theta(y)$ , the electron phase  $\phi(y, \theta_0)$ , and the velocity deviation  $2Cu(y, \theta_0)$  were computed for several values of  $C$ ,  $K$ , and  $b$  at  $B = 1$ ,  $A_0 = 0.0225$ , and  $d = 0$ . Zero-space-charge solutions are presented for  $C = 0.05$ ,  $0.1$ , and  $0.2$  with  $b$  as the parameter in order to determine the value of  $b$  which gives the maximum saturation gain and the optimum tube length. For  $C = 0.1$  similar solutions are obtained for two values of the space-charge parameter  $K$ ,  $1.61$  and  $3.42$ . Then the input-signal level  $A_0$  is varied for a fixed  $C$ ,  $K$ , and  $b$ .

In addition, the effect of attenuation along the helix is determined by obtaining solutions for several values of the loss parameter  $d$ , namely  $0.1$ ,  $0.25$ ,  $1.0$ , and  $2.0$ , with fixed injection velocity and then the effect of attenuation in lowering the optimum injection velocity is shown through solutions for several values of  $b$  at  $d = 2.0$ . Finally, the effect on the saturation gain of the placement of the loss is studied: solutions are given for loss beginning at approximately  $2$ ,  $3$ , and  $4$  wavelengths respectively from the input.

358 pages. \$4.48. MicA 55-2106

#### STABILITY OF BILATERAL FEEDBACK AMPLIFIERS

(Publication No. 12,813)

Norbert Schalk, Sc.D.  
Washington University, 1955

Chairman: R. J. W. Koopman

This research is a study of the synthesis of bilateral feedback amplifiers, and of the stability of such networks. This required a new method for determination of rational polynomial fractions corresponding to simultaneously prescribed amplitude-and phase-versus-frequency characteristics which is described. Further, a method for the synthesis of the closed loop of a bilateral feedback amplifier is developed.

The problems of unconditional stability and conditional stability, which have previously been investigated for the unilateral feedback amplifier only, are investigated for the bilateral feedback amplifier. Unconditional or Bode stability is shown not to apply for the most general case of either unilateral or bilateral feedback amplifiers. Conditional stability is shown to exist (theoretically and experimentally) for a bilateral feedback amplifier by means of a simpler open-loop transfer characteristic (iteratively-terminated open-loop) than the open-loop transfer characteristic (iteratively-terminated open-loop) obtained by Peterson, Kreer, and Ware for a unilateral feedback amplifier. While the bilateral feedback amplifier transfer characteristic itself is a simple function, negative elements are required for construction of the network.

Finally, a bilateral feedback amplifier having a transfer characteristic similar to that obtained by Peterson, Kreer, and Ware is also synthesized theoretically, but is shown not to be useful from the standpoint of physical measurements.

167 pages. \$2.09. MicA 55-2107

#### END-RING POSITION EFFECTS ON INDUCTION MOTOR LEAKAGE REACTANCE

(Publication No. 12,816)

Eugene Francis Tims, Sc.D.  
Washington University, 1955

Chairman: R. J. W. Koopman

The object of this dissertation was to determine experimentally the effect of end-ring position on the leakage reactance of squirrel-cage induction motors. The further object was to so improve an existing formula that it would give a reasonably good prediction of the experimental results.

The experimental approach consisted of obtaining four machines equivalent in every essential respect except the core length. Then after taking locked rotor input power, current, and voltage data for each of several end-ring positions, the leakage reactances were calculated in the normal manner. For each of eight end-ring positions the reactances for the four machines were plotted against core length and the resulting line extrapolated to give the reactance at zero core length. This reactance for zero core length was taken as that part of the total leakage reactance attributable to the end windings. The eight values thus obtained were plotted against ring position to present the variation in end winding leakage with end-ring position.

The basis upon which Alger's formula was derived led to its selection for an attempt at refinement. The addition to his formula consisted of first a term to account for the variation in coupling between the axial component of the stator end windings and the rotor bar extensions for the several end-ring positions. Second, terms were added to account for the end winding leakage reactance of the rotor. These rotor terms included a consideration of the coupling between the rotor and stator.

Although the values calculated with the formula are somewhat larger than those obtained experimentally, the agreement is good considering the complexity of the problem.

The investigation shows a decided dependence of the leakage reactance on end-ring position. Further, there is a definite position of the end-ring for which the leakage is a minimum. The formula given represents a considerable improvement over others for at least the particular winding used in the experimental machines of this study.

123 pages. \$1.54. MicA 55-2108



## ENGINEERING, MECHANICAL

**THE USE OF ENERGY PRINCIPLES  
AND ELASTIC-PLASTIC THEORY IN  
THE ANALYSIS OF THERMAL STRESSES**

(Publication No. 13,040)

Fazil Erdoğan, Ph.D.  
Lehigh University, 1955

The first part of the dissertation deals with the application of the variational principles of the theory of elasticity to thermal stress problems. Throughout this part the material is assumed to be linearly elastic and the thermoelastic constants (modulus of elasticity, Poisson's ratio, coefficient of linear thermal expansion and coefficient of thermal conductivity) are assumed to be independent of temperature.

A displacement potential is used in the application of the theorem of minimum potential energy. The variational equation is reduced to a form suitable for the application of numerical approximate methods. Various numerical methods (Rayleigh-Ritz, Galerkin, Collocation, Biezeno-Koch, Least Squares, and a proposed combined method) are briefly discussed. The method of application of the principle of minimum complementary energy is also indicated.

Using the Laplace transforms in energy principles, a method is developed to make it possible to attack the transient thermal stress problems by the numerical methods. In the appendices, the formulation of the thermal stress problems in cylindrical and spherical coordinates are given. Numerical examples demonstrating the application of various approximate methods to problems arising from steady-state and transient temperature distributions are also included and calculated values are compared with the results obtained by the corresponding exact solutions. The tabulated results show that, in the case of steady-state thermal stress problems, the convergence of approximate methods developed from the energy principles are good and for two arbitrary coefficients the maximum percentage error is 5.64 for the worst (Galerkin's) and 0.05 for the best (two line integral) method. In the transient problem solved only two arbitrary, time-dependent coefficients are considered and the error, in this case, is within 5 percent.

In the second part of the dissertation a first attempt is made to evaluate the elastic-plastic and the resulting residual stresses caused by high temperature gradients. Usually residual stresses may develop from steady-state nonlinear temperature distributions as a result of the relaxation of the thermal stresses by the phenomenon of creep even though the peak stresses are below the corresponding yield points. On the other hand, severe changes in thermal boundary conditions may give very high transient stresses as a result of high temperature gradients. These stresses may locally exceed the corresponding yield stresses and part of the body may undergo a plastic deformation. Thus, on reaching a steady-state condition, a state of residual stress may develop. In this analysis only one dimensional heat flow is considered. The material is assumed to be perfectly plastic and the yield stress is taken as a function of temperature.

The problem of elastic-plastic stress distribution in infinitely long thick-walled cylinders with a given temperature and stress boundary conditions is formulated for compressible and incompressible materials. The differential

equations obtained for the compressible material do not yield a closed solution. For the incompressible material the problem is reduced to simple quadratures. A number of closed solutions are given to some statically determinate problems. Exact solutions are given for thick-walled spherical shell and constrained plate. A closed solution is given for a narrow ring (or a short hollow cylinder) neglecting the axial stresses. It is also shown that a closed solution can be obtained for relatively thin-walled long cylinders if the radial stress is neglected. Numerical examples for the elastic-plastic and the residual stress distributions are given in the appendices.

152 pages. \$1.90. MicA 55-2109

**A STUDY OF STEADY STATE TEMPERATURE  
DISTRIBUTION IN THE BOTTOM  
OF BLAST FURNACES**

(Publication No. 12,455)

Taghi Jalaleddin Mirsepassi, Ph.D.  
Columbia University, 1955

As iron penetrates into the pores and between the joints of bricks and blocks of blast furnace bottoms the steady state temperature distribution in such bottoms undergo major changes. This steady state distribution is studied before and after iron penetration into the lining. Two methods are applied: (1) electrical-analogy method, (2) analytical method. In the analytical method the temperature distribution before iron penetration is found by means of the iterative method of Schwarz. For determining the temperature distribution after iron penetration a theorem is developed which is of general application in heat transfer as well as other potential fields (e.g., diffusion and electricity). Based on the above theorem, new concepts of design of high-temperature structures in general are discussed; a simple method for determining the temperature distribution in bodies with temperature-dependent thermal conductivity is developed.

160 pages. \$2.00. Mic 55-271

**INVESTIGATION OF CERTAIN ASPECTS  
OF JOURNAL BEARING PERFORMANCE  
UNDER NON-LAMINAR FLOW CONDITIONS**

(Publication No. 12,472)

Melvin Irving Smith, Eng. Sc.D.  
Columbia University, 1955

All journal bearings today are designed for operation under such conditions that laminar flow prevails in the lubricant film. In this investigation, a journal bearing was tested to speeds exceeding five times the critical value at which laminar flow became unstable. The bearings had a 1:1 length-diameter ratio, and a clearance ratio of 2.93 mils per inch. The apparatus was designed with the object of obtaining information regarding film thickness, bearing torque, and film pressure over a range of speeds and loads.

In the laminar region, the load-carrying ability and frictional characteristics of the test bearing conformed closely to the predictions of available theory.

By analogy to laminar behavior, a two-dimensional theory of turbulence was developed to predict performance, based on the assumption that a turbulent pressure flow would be superimposed upon a turbulent shear flow in the film. It was found, however, that a laminar pressure flow was maintained up to the highest speed investigated. Therefore, the load-carrying characteristics were essentially those given by laminar theory. There was, however, a closer approach to the infinitely long bearing at higher speeds. Whirling of the bearing in the turbulent zone was effectively suppressed by application of a light load.

The frictional characteristics of the unloaded bearing were similar to those observed in other systems, in that the behavior of the coefficient of friction sharply defined regions of laminar, "transition", and turbulent flow. The point of departure from the laminar region was given quite accurately by Taylor's criterion applied to the concentric bearing.

With the application of load, the torque exerted on the bearing dropped sharply, and attained a relatively constant value at lower speeds. The journal torque also decreased with load up to a certain point, after which increases were noted at lower speeds, and a tendency to level-off at higher speeds.

An explanation for these phenomena was offered on the basis that pressure gradients developed in the load-carrying arc of the film acted to restore the flow in that region to the laminar state, while flow in the crown of the bearing remained turbulent. 213 pages. \$2.66. Mic 55-272

## ENGINEERING, MECHANICS

### ANALYSIS OF HYDRODYNAMIC PROBLEMS RELATED TO DIVERTORS

(Publication No. 12,649)

George Sonnemann, Ph.D.  
University of Michigan, 1955

A theoretical and experimental investigation of the hydrodynamic characteristics of a divertor was undertaken in order to obtain a better understanding of the influence of certain parameters upon performance. These parameters are the lift, drag and incidence of the lift vanes.

Using a model designed at the University of Michigan, which consists of two lift vanes covered by end plates, a systematic series of tests was conducted in the towing tank to confirm some aspects of the theoretical work. When the divertor is in its design orientation, the lift vanes are perpendicular to the water surface and the end vanes are parallel to the water surface. The divertor rides submerged while being towed by means of a cable attached below the water surface to the towing tank car. The cable force and the divertor orientation as well as the cable divergence angle from the direction of motion of the towing car were recorded by means of still pictures.

The theoretical analysis evaluated the effect of end plates with overhang for biplanes. It was found that their effect is independent of the gap of the lift vanes. Moreover, from the experiments the lift vs. angle of attack curve revealed that the experimental work confirmed the end plate theory of Hemke.

After experimentally establishing that the problem can be made two dimensional and that the influence of the Reynolds number is negligible, tests were conducted to check the theoretical lift vs. drag curve. It was found that for the particular model tested a thirty per cent discrepancy arose with the experimental drag higher than the theoretically predicted drag. Literature research revealed that this disagreement can be traced to the surface roughness of the model and additional experimental information corroborates this supposition.

The cable divergence angle can be predicted within  $\pm 2\%$  provided the drag data of the divertor is accurately known. In analyzing the stability of the divertor cable system it was found that the static stability of the system is very strong and that large changes of the lift vane angle of attack due to rotation of the divertor can be permitted before instability sets in. In general it was observed that the stagger of the lift vanes, which is forty-five degrees for the experimental model, could be reduced without seriously diminishing the stability. Furthermore, depending upon the geometry of the bridling system which connects the towing cable to the divertor proper, the decalage angle of the lift vanes can be changed from positive to negative. The latter angle was desirable since it reduces the overall drag of the system.

Launching of the divertor from the towing car platform with all of the cable played out was recorded by motion pictures. Analysis of the film revealed that the system is highly damped and that the cable force increases eleven fold during the ten-second launching period. The peak force occurs two seconds after release and is accompanied by a resultant velocity increase of 2.7 times the towing velocity. Theoretical solution of the launching equations was not possible due to the high degree of non-linearity of the equations and the dynamic coupling of the variables.

Set forth in the paper are the methods which can be utilized to analyze any towed lift producing device and experimental methods which will check the theoretical work and give greater insight into the physical problem. 111 pages. \$1.39. MicA 55-2110

## ENGINEERING, METALLURGY

### MILD STEEL WELD METAL POROSITY

(Publication No. 13,034)

John Thomas Ballass, Ph.D.  
Lehigh University, 1955

This was an investigation into the cause of porosity in mild steel weld metal with the shielded-inert-gas-metal-arc-process. The significance of weld metal deoxidation, carbon content and weld depth penetration



on porosity has been emphasized. Porosity was completely eliminated in the presence of sufficient amount of deoxidizers. Decarburization zones were detected around voids by microhardness measurements. Penetration into regions of apparent segregations was directly related to high current level porosity. The carbon monoxide reaction was evaluated to be the underlying cause of porosity in carbon steel welds. Sulfur present in large quantities did not cause porosity in mild steel weld metal under normal welding conditions. 77 pages. \$1.00. MicA 55-2111

#### TORSION DEFORMATION STUDIES ON ZINC SINGLE CRYSTALS

(Publication No. 13,038)

James Gore Darrah, Ph.D.  
Lehigh University, 1955

Studies were made of zinc single crystals that were subjected to a torsion couple about the crystal rod axis in an attempt to determine the mechanism or mechanisms of deformation.

The studies were divided into three parts: (1) visual observation, (2) Laue back reflection x-ray analysis and (3) Metallographic studies.

The results of these studies show many mechanisms operating and contributing to torsional deformation. Those that have been identified and supported include (1) slip, (2) twinning, (3) kinking or buckling and (4) bending. Faulting of the HCP lattice was suggested by non-Laue streaks observed on the x-ray patterns.

All mechanisms indicated in the preceding paragraph were seen to operate in crystals of all orientations, but in varying degrees. These differences made generalizations of torsional deformation impossible but allowed the different types of crystals to be separated into three groups. These groups are (1) crystals whose basal plane is nearly parallel to the crystal rod axis, (2) crystals whose basal plane is nearly perpendicular to the crystal rod axis and (3) crystals of intermediate orientations. The first two groups acted somewhat more like isotropic materials than those of the latter group. Those of the latter group were observed to change their cross sectional shape markedly during deformation.

Slip on prism planes as well as basal planes was observed, identified and recorded. Slip was also seen to occur on 2nd order as well as 1st order prism or pyramid planes. Failure by cleavage on both these planes was observed in the crystals studied.

Failure in all crystals occurred on a cleavage plane at the terminus of low angle boundaries developed during the deformation. Investigation of this failure supports Orowan's picture of initiation of fatigue failure and Zener's theory of fracture.

This study shows that torsional deformation is not a singular mechanism but consists of different combinations of many deformation processes in various crystals. Proposals for further study are indicated.

117 pages. \$1.46. MicA 55-2112

#### A STUDY OF VAPOR-DEPOSITED IRON POWDERS

(Publication No. 13,041)

Andrew J. Griest, Jr., Ph.D.  
Lehigh University, 1955

The magnetic properties and physical nature of vapor-deposited iron powders were investigated with respect to the variables of deposition, i.e., (a) the temperature of condensation and (b) the strength of a magnetic field applied normal to the condensing surface. The effect of the temperature of condensation was investigated in the range  $-196^{\circ}\text{C}$  to  $100^{\circ}\text{C}$  and the effect of field strength in the range 0 to 900 oersteds. Measurements made on the powder samples included (a) intrinsic coercivity, (b) metallographic examination to determine particle size and shape and (c) x-ray diffraction analysis to determine the state of strain and crystallite size in the particles.

The powders were prepared by condensation of iron vapor on a copper condenser plate. The evaporation was carried out from an induction-heated melt of iron maintained at a temperature of approximately  $1650^{\circ}\text{C}$ . In a 10-minute period, roughly 0.3 grams of iron were collected on the condenser. Evaporation was carried out at a residual pressure of  $5 \times 10^{-6}$  mm. of Hg. The supersaturations of vapor were extremely high, e.g.,  $10^{42}$  at a condensation temperature of  $100^{\circ}\text{C}$ .

At a condensation temperature of  $-196^{\circ}\text{C}$ , the coercivity of the powders increased from a value of under 20 oersteds to about 120 oersteds as the applied field was varied from 0 to 825 oersteds. The deposits became more powdery in nature as the field strength during deposition increased.

A similar effect of field was observed at  $-78^{\circ}\text{C}$ , but to a lesser degree. The maximum value of coercivity, 120 oersteds, obtained at this temperature occurred for iron deposited in a field of 900 oersteds. The particle size was about  $5-20 \mu$ .

At a condensation temperature of  $10^{\circ}\text{C}$ , a magnetic field during deposition had essentially no effect. Coercivities of approximately 65 oersteds were obtained for samples deposited in fields ranging from 0 to 800 oersteds.

X-ray diffraction examination of the high-coercivity iron showed considerable line broadening. An analysis made of this broadening, using the technique of Warren and Averbach, indicated that it was primarily due to internal strain in the crystals. The value of strain obtained, about 0.004, appears to be sufficient to account for the observed coercivities in terms of Kersten's analysis of the effect of internal stress on domain wall movement. The iron particles obtained in the present work were large enough to sustain domain walls. The origin of the strain present in vapor-deposited iron may probably be attributed to (1) coherency strains and / or (2) magnetostrictive strains.

Finer particles were obtained by condensation of iron vapor in molten ( $100^{\circ}\text{C}$ ) low melting alloy. Applied fields of 400-800 oersteds were used. At 500X, the iron appeared to be present in the solidified "matrix" as a very fine dispersion. Coercivity values of about 130 oersteds were obtained in several samples prepared by this technique.

99 pages. \$1.24. MicA 55-2113

### THE EFFECT OF MICROSTRUCTURE ON NOTCH TOUGHNESS

(Publication No. 13,042)

John Hammes Gross, Ph.D.  
Lehigh University, 1955

The report presents a detailed study of the effect of ferrite-pearlite aggregates on notch toughness.

The increased importance of brittle fracture with the advent of mono-metallic welded structures is discussed. Recent concepts of the explanation of brittle fracture based on flow and fracture curves are presented as well as the factors that control notch toughness. Justification for use of the V-notch Charpy specimen at low energy absorptions as the notch toughness criterion is developed. The possible means of improvement of notch toughness through heat treatment is considered.

Experimental procedures of specimen preparation, heat treatment, and testing are described. Materials employed were commercial grades of C1032, C1080, C1084, and C1095 steels. Heat treatment to various microstructural aggregates of ferrite and pearlite was obtained by isothermal transformation in lead. Microstructure of the C1080 steel was quantitatively expressed in terms of the pearlite spacing. However, substantial spheroidization of the pearlite indicated pearlite spacing to be unsuitable as the microstructural parameter. Mean reaction temperature was measured and used to characterize the resultant microstructure. Transition temperature was determined by means of the standard V-notch Charpy test using low values of energy absorption as the interpretive criterion. Tensile properties were determined for each type of microstructure produced and related to notch toughness.

Results of the investigation indicate that in a fully pearlitic steel the transition temperature increases with decreased pearlite spacing. Correspondingly the hardness and tensile strength increase. Commercial grades of nominally eutectoid steels exhibit substantial amounts of carbide spheroidization in what is usually considered a lamellar aggregate. The notch toughness is markedly influenced by spheroidization. Failure of coarse-grained pearlitic steels to improve in notch toughness at the highest reaction temperatures is associated with a pronounced decrease in spheroidization resulting in a minimum in the transition temperature-reaction temperature relation. Elongation as measured in a standard room temperature tension test correlates well with transition temperature for eutectoid steels.

Previous publications indicating improvement in notch toughness with decreasing pearlite spacing in hypo-eutectoid steels is refuted. Results of an investigation on C1032 steel indicate pearlite spacing to be of little importance. Improvements reported previously were the result of a general decrease in fineness of the microstructure. When the ferrite grain size is maintained constant, improvement due to the structure of pearlite is limited to an average of 20°F. No correlation between tensile properties and notch toughness was observed in the C1032 steel.

78 pages. \$1.00. MicA 55-2114

### THE DISTRIBUTION OF SULPHIDE INCLUSIONS IN IRON

(Publication No. 12,599)

Alfred Shou-bing Keh, Ph.D.  
University of Michigan, 1955

In this investigation, the distribution of sulphide inclusions in iron was studied, with particular emphasis on the effect of heat treatment and certain alloy additions. The effect of sulphide inclusions on the grain growth of iron was also investigated.

High purity iron was used as the raw material. Sulphur, both radioactive and non-active, in the form of iron sulphide was added to the iron capsule for various melts. Other alloy additions included silicon, aluminum, manganese, oxygen as well as manganese and oxygen. Various iron-sulphur alloys were made in the induction and the resistance furnaces. Heat treatments covered the range from 850°C to 1,400°C, and lasted long enough to establish the geometric equilibrium of the sulphide phases. A mercury quench was employed in order to preserve the high temperature sulphide structures. For the grain growth study, a thermal etching method was used.

It was found that the as-cast structures consisted of sulphide inclusions in two different kinds of distribution namely, globular and intergranular. After heat treatment, the inclusions inside the iron grains assumed spherical shapes; those associated with the grain boundaries of iron had shapes varying from globular to angular and to film types, depending upon the interfacial energies of the inclusions in the iron boundaries. Higher temperatures produced smaller dihedral angles of the individual sulphide inclusions at the grain boundary.

With the addition of silicon, the distribution of sulphide inclusions was not changed much, except for a slight modification in the alpha-gamma transformation range.

Aluminum additions resulted in the chain-type structure in both the as-cast and heat-treated specimens.

Manganese additions changed the composition of sulphide inclusions and their melting temperatures, thus changing the interfacial energy at the sulphide-iron interface and the equilibrium shapes of the sulphide inclusions.

Oxygen additions slightly modified the interfacial energy when the oxy-sulphide inclusion was a liquid phase.

With both manganese and oxygen present in the melt, the as-cast structure consisted of fine as well as coarse structures of sulphide and oxide. After heat treatment, the shapes of inclusions at the grain boundaries depended upon the compositions of individual phases.

Sulphide inclusions as a solid phase tended to anchor the grain boundary and so retarded the grain growth of iron. Likewise, a liquid sulphide at the grain boundary of iron also inhibited grain growth, but less effectively.

122 pages. \$1.53. MicA 55-2115



# FACTORS INFLUENCING THE MAGNETIZATION CURVE OF SOME BINARY ALLOYS OF IRON

(Publication No. 13,045)

Joseph S. Mathias, Ph.D.  
Lehigh University, 1955

The effect of changes in composition and grain boundary length on the magnetization curve of iron were studied using powder metallurgy techniques to prepare the alloy compacts.

Alloys of iron with arsenic, cerium, antimony and phosphorus were prepared by mixing the appropriate powders in a helium atmosphere, pressing in a die to obtain the torroid and sintering in an atmosphere of hydrogen at 1400°C for 20 hours. Further increase in density was obtained by forging the rings after the sintering treatment and then annealing them in a hydrogen atmosphere to remove the strains produced by the forging operation. Magnetic properties were measured by the Rowland ring technique. X-ray back reflection patterns did not show any obvious annealing textures developed as a result of the forge and anneal treatment.

The results indicate that in all cases addition of the alloying elements moves the magnetization curve of pure iron to the right. This movement is greater for fields in the range  $H = 0$  to 10 oersteds than in the higher ranges. There is also an increase in the coercive force and a decrease in the  $B_r/B_s$  ratio with increasing alloy content.

Magnetic annealing of the iron-cerium alloys provide higher values of induction at field strengths of 1 to 10 oersteds than are obtained by the regular annealing treatments. It is postulated that the movement of the magnetization curve to the right as a result of the addition of alloying elements is predominantly a result of the strains produced in the material by such additions, which makes it necessary to provide a greater amount of magnetic energy for the movement of 180° domain boundaries.

The increase in the values of induction obtained by Dahl, Pawlek and Pffafenberger for alloys of arsenic in the range 0 to 0.3% appears to be due to the use of iron containing impurities which are later removed by the scavenging action of arsenic, resulting in an apparent improvement in magnetic properties from arsenic additions.

In the study of the effect of changes in grain boundary length on the magnetization curve of iron, a definite indication of a shift of the magnetization curve towards the left with increase in the grain boundary length was observed. Grain boundary length was measured using the method of Smith and Guttman.

A 4% molybdenum alloy of iron was used in this study and the strain anneal technique used for providing the variation in the grain size. Magnetostriction, coercive force and remanence values were also obtained. A relation between the coercive force and the grain boundary length of the form  $H_c = A \cdot L^x$  has been observed in the range tested. However, this equation will probably not hold for extremely large grain boundary lengths.

104 pages. \$1.30. MicA 55-2116

## GEOGRAPHY

# CHINESE GREAT EXPLORERS: THEIR EFFECT UPON CHINESE GEOGRAPHIC KNOWLEDGE PRIOR TO 1600

(Publication No. 12,550)

Kuei-sheng Chang, Ph.D.  
University of Michigan, 1955

The history of geographical exploration is widely recognized as an essential element to the development of geographical knowledge. Although a number of books have been published in this field of study, the events covered in these works are primarily concerned with the accomplishments of Western explorers and those of the Arab travelers. Only in rare instances have Chinese geographical discoveries been mentioned and none has been discussed in more than fragmentary form. Ample sources of Chinese materials have remained largely untouched and, as a result, an adequate picture of Chinese exploration has not yet been presented. The purpose of this study is to illustrate all the important geographical discoveries accomplished by Chinese explorers and their effect upon the geographical thought of the various stages in Chinese history.

The division of the text is based partly on individual explorers who had epoch-making influence on the history of Chinese geography, and partly on the periods in which

no single person appears dominant. In order to make this study more understandable to Western readers frequent reference has been made to corresponding periods of European history. It is the writer's intention that, by drawing some of the important parallels and contrasts between the two, this study may present a connected view of the development of world geographical knowledge.

In view of the history of Chinese geographical discovery and the development of geographical knowledge in China, several important stages are clearly recognizable. From the early Chou to the late Han dynasty may be called the Age of Initiation, during which time many discoveries were initiated from China without any outside influence. The second stage is called the Age of Uncertainty, which is characterized by the extensive travels of Buddhist pilgrims, and was a result of the spread of Buddhism in China. The next stage is called the Age of Accumulation, in which geographical information was chiefly obtained through trade with the Arabs. Following this was the Age of Elaboration, in which much information previously accumulated was converted into more accurate knowledge. The last age was marked by the arrival of the Jesuits, who brought to China a substantial amount of scientific knowledge and thus helped to establish the foundation for Chinese modern geography.

Several conclusions are drawn from this study. Each stage has a certain dominant feature which underlines the nature of the geographical discoveries and the development of geographical knowledge. The ancient geographic concept is highly mixed with fables, myths and speculations, which in fact constituted an incentive to a series of subsequent discoveries. The fable of the "Western Royal Mother," the myth of the "Three Celestial Islands" in the Eastern Sea, the speculation on other land masses as embodied in Tsou Yen's "Nine Great Continents" theory, and the legend of the "Kingdom of Women" all played a conspicuous role for several centuries.

The long period of China's struggle against the Hsiung-nu nomads had the advantage of compelling the Chinese to discover other cultural worlds. Before the end of the Han dynasty, the Chinese had already had a considerably accurate knowledge of Western Asia and the general concept of the location of the Roman Empire. But the discovery of the Tarim River by Chang Ch'ien caused great confusion in Chinese geography. For nearly fourteen centuries this exotic stream was regarded as the source of the Hwang Ho.

The spread of Buddhism in China had the effect of diverting the Chinese interest to the study of the Buddhist world. By the middle of the eighth century, the whole Buddhist world had been thoroughly explored by Chinese Buddhist pilgrims.

Through many centuries of trade and contact with the Arabs Chinese geographers learned a great deal about the African continent. By the end of the thirteenth century geographers already knew a large part of Africa. This includes the source of the Nile, the Sudd region, the Sudan area, a number of oases in North Africa and the entire coast of Africa, with perhaps the one exception of that opposite the Canaries. On the other hand, the Chinese knowledge also had considerable influence upon that of the Arab world, particularly in the Southern Iberian peninsula.

By collation of a vast amount of evidence it may also be concluded that a large portion of the world land surface was known and that the concept of the global world had already developed before the end of the thirteenth century. The model of the globe made in 1273 should be regarded as one of the most outstanding events in the history of geography. With all the information then available, the cartographer was able to draw the land and water bodies of the earth in such a way that they came out with the ratio of seven parts water and three parts land. In addition, parallels and meridians were drawn on the globe and the locations of many major cities were determined.

The seven great voyages of Cheng Ho's expedition (1405-1430) were the greatest undertaking in sea exploration in world history before the Industrial Revolution. The expedition was well enough equipped to have sailed around Africa and land in Australia more than half a century before Da Gama's voyage. However, the diplomatic nature of their mission determined the area of their activities, and limited the scope of exploration to areas under established rule. 457 pages. \$5.71. MicA 55-2117

# MAGUGU: POPULATION AND LAND USE IN A RESETTLEMENT PROJECT IN THE NORTHERN PROVINCE OF TANGANYIKA

(Publication No. 13,080)

Charles Wallace Dierickx, Ph.D.  
Northwestern University, 1955

In 1943 an outbreak of sleeping sickness in the Kiru-Magugu area of Tanganyika, located in the Rift Valley ninety-seven miles southwest of Arusha, forced the Government to take drastic measures to protect the lives of the Africans living there. The complete evacuation of the area posed the problem of providing for the evacuees land free of tsetse flies, the carriers of sleeping sickness. As a solution to this problem, a plan was devised to clear the vegetation from the northern, or Magugu, part of the area.

During 1944, 1945, and 1946 the clearings were completed and finally made Magugu an island of safety within the tsetse area. Once the clearings and an irrigation ditch were completed, settlement began. African farmers started tilling small plots of land and extending irrigation to their new fields. A trading settlement was set up; a system of local Government was created; a public auction for marketing produce started to function; and public works such as roads and bridges, dispensary, jail, and court house were built. At the same time, the present pattern of land use and adaptation to the environmental conditions began to evolve.

The land utilization pattern is treated not only from the standpoint of the size of fields and kinds of crops grown, but also from the point of view of its relations to such matters as tribal origins, religion, numbers of wives, location, site, topography, climate, vegetation, soils, and markets.

Interviews with all the farmers living at Magugu, 395 in number, revealed that the average size of cultivated holdings is small. It is only 2.53 acres, with an average of 3 1/2 fields per farm and an average field size of 0.71 acres. The main crops raised are millet, corn, and rice, in that order. Although millet is strictly a non-irrigated crop, and corn nearly so, all rice is irrigated. There are more fields of corn than any other crop, a reflection of its common use as a human food by the African. However, millet commands the largest acreage, and the average millet fields are larger than those of other crops. Rice also covers large fields, reflecting that proportionately less work is needed to prepare a large paddy for production than for a small one. The great cash crop of the Magugu farmer is the castor bean; most of the other crops are consumed by the grower. Cassava, sweet potatoes, peanuts, sugar cane, and several other crops are also grown on diminutive plots.

Although Magugu has progressed greatly in the ten years of its existence it has far to go before realizing the full agricultural potential of the area. For continued advance several things are necessary. Regenerating bush must be kept down to prevent tsetse infestation. Studies of the climate and soils are needed to discover what crops can best be grown. Irrigation facilities, the chief condition limiting expansion, must be increased in order effectively to supply water not only to the present crop land but also to a greater acreage. Health



conditions, including the creation of a pure water supply for human use, expanded medical facilities, and educating the African to cope with his health problems, must be improved. Education in simple technical matters is needed to raise the stand of living. The problems of better seeds and wise livestock management should be solved. Herd culling, hay making, and controlled grazing should be practiced; and a long process of education is needed before the African will change his attitudes toward cattle. Transportation facilities must be improved if products are to reach distant markets.

The question is often raised as to whether or not a resettlement scheme, such as Magugu, justifies the funds spent. At Magugu the question is answered in part by a happy population of Africans, representing fifty-five tribes, who, but for the Magugu clearance, might be a landless people. Freedom, happiness, and the saving of life itself can hardly be measured in money.

303 pages. \$3.79. MicA 55-2118

#### ST. AUGUSTINE, FLORIDA: A STUDY IN HISTORICAL GEOGRAPHY

(Publication No. 13,011)

John Robert Dunkle, Ph.D.  
Clark University, 1955

Supervisor: Samuel Van Valkenburg

This study is directed toward depicting St. Augustine in the several periods of its development so that the present community may be understood in terms of the geographic factors which have played a roll in its evolution. Particular attention has been given to the elements of cultural geography, discovering their origins and tracing their changing pattern.

During the years between St. Augustine's founding in 1565 and the cession of Florida to Britain in 1763 the city served primarily as a military and mission center for the conquest of Florida. Attempts to develop the hinterland were small and met with failure because the land was never adequately appraised due to the disinterest of the military population. However, a cultural pattern was emplaced on the immediate site which has persisted to the present. A stone fort was built opposite the shallow bar which so well protected the harbor. The present modified rectangular street pattern was established around a plaza south of the fort. Major place names such as Anastasia Island and Matanzas River have persisted.

Under British control (1763-1783) the difficult harbor entrance which had proved so valuable in defense was a major obstacle in the new government's effort to make of St. Augustine a commercial port for plantation expansion into the hinterland. This effort never reached fruition, however, for it was interrupted by the American Revolution. For a time St. Augustine returned to its military function serving as a depot for troops. Further, St. Augustine was the recipient of over 6,000 loyalists who fled from Georgia and the Carolinas. The community, limited by the rivers to the east and west, faced great problems of overcrowding.

Spanish architecture was much altered. The Spanish

houses, constructed of the locally available coquina, had flat roofs, walled gardens and grilled windows. The British steepened the roofs, replaced palm thatch with shingles, added chimneys and placed glass in windows.

Upon the return of the Spanish the loyalists emigrated and the site returned to its defense function. Attempts to settle the land were abandoned. A cathedral was built facing the plaza and the British market at the foot of the plaza was retained. A Minorcan group and the negro slaves brought to St. Augustine by the English formed the major elements of the population. Through their efforts in cultivating the local soils St. Augustine was more nearly self-sufficient than in the first Spanish period.

Florida was ceded to the United States in 1821 and by 1840 it had evolved its present function as a tourist city, based upon its coastal location, its "healthful" climate and its old-world charm. The difficulty of access of early years (via the St. Johns River and a short rail line to the city) was overcome in 1883 as a rail line was extended southward from Jacksonville toward Miami. Several large luxury hotels in the Spanish Rocco style were built in connection with the rail development. For a time, till the center of tourist attraction moved south, St. Augustine was the "Riviera of America."

Today with easy highway access to New York St. Augustine continues to base its economy upon the appeal of its Spanish, English and early American cultural remnants coupled with its sub-tropical climate and nearby beaches. The unique character of the city assures it of a continuing place among the tourist attractions of Florida.

306 pages. \$3.83. MicA 55-2119

#### REPOPULATION OF SARDINIA

(Publication No. 12,596)

Ferencz Paul Kallay, Ph.D.  
University of Michigan, 1955

The purpose of this study is to analyze the major causes of underpopulation in Sardinia and to indicate ways by which the present, on the whole primitive, economic conditions can be improved and the resources of the island can be utilized more intensively for the benefit of a much larger population.

By way of explaining the present isolation and underpopulation, it is pointed out that the island had been conquered and originally developed by the Romans both as an important naval station and because of its value as a major wheat producing region. But when Rome conquered Egypt, the latter quickly became the principal grain producer of the Empire, and Sardinia thereby lost its earlier importance as a source of grain. The strategic importance of Sardinia was also diminished because the Romans relied more and more on Sicily as a stepping stone to Africa and as a naval base controlling the central Mediterranean. The most important cause of population decline, however, was malaria, which infected the lowland regions. As a result of poor sanitary conditions and the distance separating Sardinia from mainland Italy the island became almost completely isolated from the political and economic life of Italy.

Present population distribution in Sardinia is largely a result of the past history, recent sanitary conditions, and topography of the island. The population pattern is irregular, and there are potentially fertile lowland areas that could support a much larger population than the present number.

The chief occupation of the people of Sardinia is farming. Although there is far more tillable land available on the island than on the Italian mainland, agricultural development lags far behind. This is largely due to the menace of malaria on most of the tillable lowland areas. With the complete eradication of malaria, due to the anti-malarial campaign of 1946-1951, it is to be expected that there will be a substantial increase in cultivated land within the next decade. This, in turn, will enlarge the resource base and will provide a greater variety of agricultural possibilities than has been heretofore the case.

Successful malaria control is now being followed by a redistribution of farmland, made possible by the breakup of large individual holdings. The newly created small farms are receiving technical guidance and financial support from the government resettlement agencies, and it is hoped that the process of reclamation and resettlement, begun in the 1930's, will continue to gain momentum and thus bring sizable numbers of people to the island.

On the basis of a detailed analysis of physical, agronomical, and cultural factors governing the use of Sardinia's land, it is suggested that areas now in pasture and potentially good for crops be reclaimed, and that future emphasis should be on grains, horticulture, citrus fruit, as well as further development of such existing cash crops as olives and cork. Coupled with this, there must be an intensified emphasis on mineral extraction, to serve, together with newly introduced or expanded cash crops, as the base of industries producing for the mainland market.

With the recent total eradication of malaria, making the island a safe place to live in for the first time in centuries, and with adequate support, both governmental and private, for settlement projects and small industries, the island of Sardinia, it is believed, could very well support twice its present population at a higher standard of living.

127 pages. \$1.59. MicA 55-2120

#### DISTINGUISHING FEATURES IN THE ECONOMIC FUNCTION PROFILES OF MASSACHUSETTS URBAN AREAS

(Publication No. 13,017)

Harriet Ruth Long, Ph.D.  
Clark University, 1955

Supervisor: Dr. Raymond E. Murphy

The central objective of this study is to devise a functional economic classification of urban areas that will be applicable to any area regardless of size, location, or type. The state of Massachusetts is used as the statistical base for establishing the criteria.

Standard deviations from the mean of the percentages of employed workers in each of the 11 major industry groups in the urban areas are calculated. All positive deviations are considered distinguishing functions.

The industry groups fall within three major headings: primary, manufacturing, and service. Where only one major industry group is a distinguishing function, the classification is readily discernible. If any such area is classified as "service", the type of service is indicated. To obtain a summary expression in all cases where two or more industry groups are above the mean, the standard deviations (sigmas) in the service groups are averaged. If the average is less than the positive deviation of either the primary or manufacturing group, the initial classification of the urban area will be "primary" or "manufacturing" depending upon which one of these groups carries the higher standard deviation. If both the primary and manufacturing services have higher scores than the average for the service groups, they are listed preceding the service category.

If the average for the service categories is above either the primary or manufacturing group deviations, the service classification becomes the initial one. If only one type is above the average, it indicates the service classification. When two or more groups are found to be above the average, the term "multiple service" is applied.

By calculating the standard deviations in tenths, all industry groups with positive deviations become a part of the study. In the final classification process, when the goal is to have fewer and broader categories, no number is used to show the degree of deviation between the mean and 0.9. A superscript "1", or "2" or "3" is added to indicate the number of sigmas above the mean. To indicate the most distinguishing functions in the multiple service classification, all groups two or more sigmas above the mean carry the superscripts "2" or "3".

All items in the final classification are abbreviated and arranged in descending order of importance. To check the reliability of results, the statistical findings are compared with questionnaire responses giving the viewpoint of residents regarding the number of persons employed in the industry groups. Special application of the method is made to the 17 incorporated cities within the Boston Urbanized Area.

The functional economic classification of urban areas is a supplemental step in the evolution of classification systems. It includes the newly delimited and defined unincorporated places of more than 2,500 inhabitants and urbanized areas. The use of standard deviations permits an accurate measure of the variability of economic functions in each urban area and a comparison of the degree of variation among the areas.

Profiles, constructed to show the amount of deviation above the mean in the major industry groups, illustrate the individuality of urban areas. They also show the wide variation between any two urban areas by presenting, without combination, each of the distinguishing functions.

This study reveals the downward trend in the proportion of the working population engaged in manufacturing and the increase in the proportion of workers engaged in the service industry groups.

By basing the present study on the state of Massachusetts, the method devised is applied to a substantial number and variety of urban areas. The results indicate that the method will be applicable to any urban area regardless of size, location, or type.

135 pages. \$1.69. MicA 55-2121



## RIVER TO SEAWAY

(Publication No. 12,613)

Neil Max McArthur, Ph.D.  
University of Michigan, 1955

The purpose of this study is to determine, so far as is possible on the strength of historical development, locational assets, and a comparison with other river communities, the future of six towns located on the north shore of the St. Lawrence River in the International Rapids section of Ontario. The St. Lawrence Deep Seaway and Power Project is being carried out largely in this section of the river, and the impact of so large an undertaking upon the economies of these six centers will be considerable. In addition several of the river communities will be directly affected by flooding from the new dams which are being built as a part of the development. Each of the six communities, Cornwall, Morrisburg, Iroquois, Cardinal, Prescott, and Brockville, has some problems which the Seaway construction presents, but most stand to gain benefits from the project which may offset their difficulties.

The introductory chapters of this study deal with the original settlement of the river communities, with past canal-building projects, and with geographic and geologic descriptions of the urban sites and the lands between which front on the St. Lawrence. The three following chapters deal in some detail with the present economies of Cornwall, Brockville, and Prescott. None of these centers derives much business from present river traffic. Cornwall seems most likely to benefit in a material way from the project because the largest engineering works, the main dams and power plants, are being built nearby. One chapter is devoted to a similar consideration of the three small centers, Morrisburg, Iroquois, and Cardinal. Iroquois is to be completely flooded out and present plans call for relocation on an entirely new site. Morrisburg is to be partially flooded, and the functional part of the town must be relocated if the community is to survive. Cardinal will not be greatly affected by flooding.

The last four chapters are devoted to considerations of the navigational improvements and electric power development of the Seaway and Power Project as they affect the St. Lawrence communities. Generally navigational improvements are unlikely to alter the economic structures of these towns because there are neither port facilities nor markets for goods which might be carried in large vessels. The present small canal vessels and the railways will continue to serve the St. Lawrence towns. Power from the development is to be distributed throughout Southern Ontario by the Ontario Hydro-Electric Power Commission, so there will be little advantage in new industrial location near its source. On the other hand labor attracted to the area by the large construction projects may remain to become a part of the local labor force, an inducement to new industrial development.

In conclusion the St. Lawrence Project seems unlikely to cause an industrial boom along the Upper St. Lawrence. Its chief virtue, so far as existing communities are concerned, is that it is finally being built, and the long period of indecision that has preceded its construction and restrained normal development, is ended.

181 pages. \$2.26. MicA 55-2122

COMPARATIVE LAND FERTILITY  
AND POTENTIAL IN THE INLAND  
SEA AND PERIPHERAL AREAS OF  
JAPAN

(Publication No. 12,634)

Forrest Ralph Pitts, Ph.D.  
University of Michigan, 1955

The basic problem of this study is to isolate and analyze the various factors in the complex which makes for high rural prosperity in Kagawa prefecture, Japan. The paradox to be explained is this: in Kagawa — an area which appears to have reached the pinnacle of Asiatic indigenous development — is to be found the highest per acre productivity and one of the highest rural standards of living in Japan, despite adverse factors which include the highest percentage of tenancy in Japan, the lowest per capita land holdings, the highest rural population density per unit of arable land, and high variability of rainfall — resulting in frequent summer drought. The secondary problem is to determine how the results of the study may be applied to less prosperous and less productive areas of Japan, in order that the agricultural production might be increased and the rural standard of living thereby raised.

The method followed in attacking this problem is to set up an *ex post facto* effect-to-cause experiment structure. Three experimental villages (*mura*) in the Inland Sea area and three control villages in outlying and less prosperous areas of the country are chosen. All are matched on the following six control factors: (1) proportionate distance from the nearest city; (2) number of inhabitants; (3) size; (4) basically agricultural life; (5) location on alluvial soil; and (6) somewhat equivalent climatic conditions.

The assumption is made that in areas having these elements of control in common, the causes of difference in prosperity can be laid directly to the history of that area in terms of consequences of feudal administration policies — as expressed in the present landscape by the development of land use practices — and the present condition of the village in the technological sense. Comparison between the two groups of villages is made on the contributory factors of feudal administration, periods of war and peace, increase in agricultural productivity, irrigation practices, home industry, off-the-farm employment, mechanization of agriculture, and annual frequency of land use.

Results are as follows: (a) the three villages located on well irrigated alluvial fans have greater per acre productivity than those located on less well-drained alluvium; (b) villages in which the feudal authorities had actively encouraged the growing of commercial crops on a large scale are the most prosperous today; (c) multiple sources of irrigation permit a high degree of control over cropping practices in Kagawa, which in turn results in an extremely high return per unit area; (d) a large variety of home industries in Kagawa permit the farmer to maintain his standard of living in spite of smaller landholdings.

The conclusion reached is that prosperity in rural Japan is a function of diversified agriculture, a highly developed irrigation system, and multiple sources of income as expressed in off-the-farm employment and a wide

variety of home industries. All these tend to overcome the lack of security to which the less developed areas are subject. 258 pages. \$3.23. MicA 55-2123

COMPARATIVE PHYSIOGRAPHY OF  
THE LOWER GANGES AND LOWER  
MISSISSIPPI VALLEYS

(Publication No. 12,527)

S. Ali Ibne Hamid Rizvi, Ph.D.  
Louisiana State University, 1955

Supervisor: Professor Grover Murray

The Lower Ganges Valley is, in many respects, similar to the Alluvial Valley of the Lower Mississippi River. The Ganges and Bengal-Assam structural troughs are comparable to the Mississippi Structural Trough and Gulf Coast Geosyncline, respectively. The Pleistocene history of the Ganges, which came into existence as the result of disruption of the westward flowing Indobrahm-Siwalik river system, is, however, unique, and has no parallel in the history of the Mississippi River.

The study of the Pleistocene terraces in the Gulf Coast area of the United States leads to a possible explanation for the formation of the Barind, Madhupur Jungle, and Lalmai Hills in Bengal, which probably are the deltas built by the Ganges, Brahmaputra, and other streams in the northward-extending Pleistocene gulf, which then stood near the Shillong Plateau.

As in the Mississippi Valley, the drainage system of the Lower Ganges Valley has undergone several changes. In prehistoric time the Brahmaputra was diverted east of the Madhupur Jungle from its ancient course, which corresponds to the modern Jamuna channel, which it re-occupied in the nineteenth century A. D. The Ganges has swung back and forth between its two most widely separated distributaries. In modern times the river has generally migrated to the east from the Bhagirathi to the present Padma-Meghna channel. Several subdeltas associated with different channels of the Ganges can be recognized in the deltaic plain.

Braiding is the most dominant stream pattern in the flood plains of Bengal, unlike which most streams of the Lower Mississippi Valley exhibit a meandering tendency. Many distributary streams of the deltaic plain of the Ganges, however, develop characteristic meander patterns.

The Himalayan tributaries of the Ganges and Brahmaputra deposit large alluvial cones which consist of gravels, boulders, and coarse sand, and have steep slopes, as the rivers debouch onto the plain from the mountains. In most of the Doab, however, the coalesced alluvial cones consist of fine and coarse sand, and bury part of the Pleistocene terrace.

The natural levees develop characteristically in the western section of the deltaic plain and exhibit a transverse gradation of material. Those of the flood plains contain larger amounts of sand and have flatter profiles.

The horseshoe-shaped dwips are associated with many active channels of the delta, but the seaward extension of the delta face has remained constant for nearly two centuries. The role of strong tidal currents is sometimes emphasized to explain the phenomenon, though, in most

probability, there are other equally important factors about which our knowledge is very scanty.

Lakes and marshes of different origin and form are scattered all over flood plain and the delta. If there is any connection between the subsidence of the Sylhet Jheels in the upper Meghna Valley and the uplift of the Madhupur Jungle, it is not yet ascertained, but there is considerable evidence in support of the view that the Jheel belt north of the Sundarbans owes its origin to subsidence. These are delta-flank depressions which, unlike those of the Mississippi Delta, are still being alluviated seasonally and have not been enlarged to the same extent. 286 pages. \$3.58. MicA 55-2124

THE POPULATION GROWTH OF THE  
BAHAMA ISLANDS

(Publication No. 12,645)

Cyrus Jewett Sharer, Ph.D.  
University of Michigan, 1955

This study describes the settlement and population growth patterns of the Bahama Islands. It approaches the subject principally from a historical-geographical point of view.

Part I outlines the early period of growth from Columbus to the arrival of the American Loyalists and their slaves following the end of the American Revolution. It describes the various periods during which the Arawak Indian, Spaniard, Englishman, and Negro made their appearances, and the role each played in contributing to the evolution of the population pattern and economy of the Bahamas. This differed according to the cultural conditioning of each group.

Part II deals with Nassau, the capital on New Providence, and all the other islands known collectively as the out-islands. The period covered is from the 1780's to the present. The individual islands are briefly described; their resources and their place in the general economy are judged in the light of their accessibility to Nassau, the economic and political focus of the colony. All of the population graphs (semi-logarithmic curves) and the sketch maps of the individual islands have been incorporated into Part II and are its main documentary supports. Each growth curve is briefly described and analyzed.

The summary draws together the individual population curves into one combined curve for the Bahamas. A comparison of it with the Nassau (New Providence) curve emphasizes the current magnetic pull that Nassau exerts on the rest of the islands. If the capital's rate of growth remains unchanged, half of the Bahamian population will soon be concentrated on New Providence.

135 pages. \$1.69. MicA 55-2125



# **PETROLEUM AND GAS IN THE ECONOMY OF OKLAHOMA**

(Publication No. 13,022)

Karl Stacey, Ph.D.  
Clark University, 1955

The mineral resources of regions admittedly have had important effects historically: mineral production has influenced migration, settlement, manufacturing, boundary disputes, and employment. This study is a quantitative survey of the economic effects of petroleum and natural gas, as the production of these fuels has affected the state of Oklahoma.

There is no record extant of the yearly production of crude oil for each county in Oklahoma, from 1900 to 1933. Approximate production amounts are arrived at, and constitute an important contribution of this study. Relationships are developed between the quantity of oil production and with population changes, and secondly relationships with the growth and the kinds of manufacturing in the state. An essential feature of the method is the selection of two equal areas, entitled the (15) "Oil Counties" and the (17) "Non-Oil Counties", these two areas having similar physical environment except for oil and gas resources. Population changes and industrial growth in these comparison areas are analyzed at length, with detailed tables of populations in cities and in counties, and quantitative tables of manufacturing in all of the counties concerned.

Further, a selection of geological data is incorporated including the production of the twenty-three "Major Fields" in Oklahoma, the normal decline curves of oil production, and the decreasing discovery rates which accompany the present increased exploration campaign. A detailed structure contour map for the entire state, showing depths to the Arbuckle limestone (Cambro-Ordovician), is a second major contribution of this study; no map of this detail has been published. This geological data is assessed, and leads to certain predictions of the ultimate petroleum resources of Oklahoma; of twelve billion barrels of primary oil in the state, eight billion have been discovered, and seven billion produced to date. Nearly all of the large oil

fields of Oklahoma have been found, and oil production is near a second peak, and will then gradually decline.

Major conclusions are:

1. Cities in Oklahoma located near oil fields show large population gains, and they have maintained population since 1930. Cities not near oil fields have shown small population changes.
2. The "Oil Counties" have increased population 150 per cent since 1910; the "Non-Oil Counties" have less population in 1950 than in 1910.
3. Oil refining, glass production, zinc smelting, mineral processing, and the manufacture of machinery are leading industries. Factories for nearly all of these have gravitated to the "Oil Counties", so that three-fourths of all manufacturing in Oklahoma is accomplished in these fifteen counties.
4. Thirty-five per cent of all manufacturing consists of industries directly dependent on oil or natural gas. Indirectly, fifty per cent of all manufacturing would not be present in the state today had oil and gas not been present in the environment.
5. A "Population Multiplier" theory is presented, relating the expected increase of population in a small region when a mineral industry is established.

Finally, predictions are made concerning changes in agriculture and in manufacturing as the annual oil supply declines. Measures to lengthen the period of decline and to meet the economic distress that will follow are considered. Oklahoma has small chances of attracting important new industries; it has few resources of other minerals, water, or timber; the state will then revert chiefly to agricultural production as its oil reserves are exhausted. The economic advantages that natural gas and petroleum have brought to Oklahoma are carefully enumerated; it is finally concluded that the withdrawal of these mineral resources will result in the removal of the economic advantages they have brought.

256 pages. \$3.20. MicA 55-2126

## **GEOLOGY**

# **STRATIGRAPHY AND PALEONTOLOGY OF THE LOWER PENNSYLVANIAN ROCKS IN SOUTHEASTERN IOWA**

(Publication No. 12,894)

David Thomas Gleim, Ph.D.  
State University of Iowa, 1955

Chairman: Associate Professor William M. Furnish

The lower Pennsylvanian rocks in southeastern Iowa (Lee, Van Buren, Davis, Jefferson, Wapello, Monroe, and Mahaska counties) are the equivalent of part of the Krebs Group and the lower part of the Cabaniss Group of the Northern Mid-Continent Area.

Detailed stratigraphic work failed to discover any horizon that could be traced over the entire area for use in correlating the measured sections. A given coal, shale, limestone, sandstone, or a particular sequence of these beds may be identified in a comparatively small area. It was not found practical to subdivide the rocks into cyclothems because of the extreme lateral variation of lithologies and the lack of persistent horizons. The fossils are valuable for regional age determination but fail to aid in detailed correlating of sections from county to county within the area.

236 pages. \$2.95. MicA 55-2127

# THE FIXATION OF HEAVY METAL CATIONS BY SOME CLAY MINERALS

(Publication No. 12,801)

John Hower, Jr., Ph.D.  
Washington University, 1955

Chairman: Arman F. Fredrickson

An investigation was made to determine the fixation power of some heavy metal cations by several clay minerals. If clay minerals could abstract and concentrate heavy metals from natural solutions during the transportation and deposition of a sediment, this would be a preliminary step in the formation of an ore deposit.

Sized samples of the clay minerals illite, montmorillonite and chlorite were treated for one month with acetate solutions of the heavy metals Ni, Cu, Zn, Ba, and Pb. The samples were then washed and leached with 1N CsCl. The amount of heavy metal not leached off by CsCl is called fixed. The treating solutions were analyzed for any Ca, Mg, or K that was released during the exchange and fixation reactions. The amount of Ca released was proportional to the size of the replacing cation. Calcium is present in the clay minerals in voids in the basal plane structure. It is suggested that the increased replacing power with increasing radius is caused by the better coordination of the larger ions in the voids of the basal planes. No relationship as a function of ionic radius was found for the replacement of Mg by the heavy metals. The lack of a relationship is taken to mean that the replacing ions did not substitute for Mg in the lattice.

All heavy metals were fixed in quite large amounts by all the clays. The range in amount of fixed heavy metal is from 3.0 meq Ba/100 g clinocllore to 47.5 meq Cu/100 g montmorillonite. An x-ray investigation showed that little, if any, of the heavy metals other than Ba were fixed within the crystal lattice. Barium was shown to be fixed in the voids in the basal planes. It is suggested that the fixation positions of Ni, Cu, Zn, and Pb are on unsatisfied oxygen bonds and/or in exposed octahedral positions around the edges of the clay mineral sheets. Copper was shown to be fixed in large amounts as a univalent complex ion - probably  $\text{Cu}(\text{OH})^+$ . Smaller amounts of Zn and possible Pb are probably also fixed as univalent complexes.

A suggestion is made that the K present in the voids in the basal plane of layer-lattice minerals is fixed by the formation of an equilibrium surface some time after the basal plane has become exposed (cleaving). When a mica is first cleaved the potassium is relatively easy to replace with another ion. However, upon aging of the surface the K is very difficult to replace. The potassium is coordinated by only six oxygens on a fresh cleavage surface; an equilibrium (or non-reactive) surface forms by the recession of the potassium ion into the structure and its coordination with a ring of six oxygens present in the layer below the surface. Polarization of the ions involved reduces the size of the void, further helping to trap the potassium ion.

Suggestions for future work are made.

69 pages. \$1.00. MicA 55-2128

# GEOLOGY OF THE HYLAND LAKE AREA, NEW QUEBEC, CANADA

(Publication No. 13,059)

Paul Michael Kavanagh, Ph.D.  
Princeton University, 1955

The Hyland Lake area is located within the Labrador trough some forty miles northeast of the great iron ore district of New Quebec-Labrador which is centred about Knob Lake. Contained within the Labrador trough are several northwest-striking, northeast-dipping groups of rocks, all presumably of Proterozoic age. In a southwest to northeast section of the trough through Knob Lake and the Hyland Lake area there are, in succession, the Knob Lake group, the Howse group, the Murdock group, and the Doublet group. The Hyland Lake area includes a small eastern portion of ground underlain by the Howse group, a complete section across the Murdock group, and a western portion of ground underlain by the Doublet group.

The Howse group in the Hyland Lake area consists mainly of thin black slate layers separated by both fine to medium-grained and porphyritic to sub-pegmatitic gabbro sills. The sills are interpreted as composite bodies.

The Murdock group in the Hyland Lake area consists mainly of basic pyroclastic rocks, chlorite and amphibole green schists, and at least one sequence of clastic sedimentary rock, including conglomerate which contains rounded fragments of jaspery iron formation. The boundary between the Howse and Murdock groups occurs along the Walsh Lake Lineament which is interpreted to represent a major fault dipping steeply northeast and having both strike slip and thrust movement, the northeast side having moved up and to the northwest relative to the southwest side. The Murdock conglomerate is interpreted to be older than the Howse group and to have derived its iron formation fragments from the Sokoman iron formation of the Knob Lake group.

The Doublet group which conformably overlies the Murdock group consists mainly of pillowed and massive metabasalts. It is suggested that the pillow structures developed through convection phenomena acting within the flows in a submarine environment.

Both the Doublet and Murdock groups are intruded by metamorphosed gabbroic sills. Much of the ferric iron in the blue-green hornblends of the gabbroic sills was contributed from the oxidation of ilmenite. The Doublet group is also intruded by six serpentinized peridotite sills. Tremolite-actinolite and chlorite alteration within the margins of the thicker ultramafic sills and throughout the thinner ones is attributed to hydrothermal solutions permeating along the contacts of the sills.

Both the Murdock and Doublet groups and associated intrusive rocks were intensely folded by regional compression directed from the northeast prior to the period of faulting along the Walsh Lake Lineament. All of the rocks underwent low-grade metamorphism during the period of folding. The more intensive deformation in both the extrusive and intrusive rocks east of Walsh Lake is attributed to the same regional forces which caused the major fault movement along the Walsh Lake Lineament.

Each of the three groups, the Howse, Murdock, and Doublet, contains sulphide mineralization. Most of the



mineralization is probably genetically related to the gabbroic intrusives associated with each of the three groups.

The geologic history of the Hyland Lake area is discussed with reference to the geologic history of the Labrador trough as a whole.

215 pages. \$2.69. MicA 55-2129

# THE STRUCTURE AND STRATIGRAPHY OF THE ANTLER CREEK AREA, BRITISH COLUMBIA

(Publication No. 13,062)

Atholl Sutherland-Brown, Ph.D.  
Princeton University, 1954

The Antler Creek area, Cariboo District, British Columbia, topographically is in a region transitional from Interior Plateau to Cariboo Mountains. In the map-area the Interior Plateau is a rolling upland at an elevation of about 6,000 feet that has been well dissected to a depth of approximately 2,000 feet. It is a peneplain that bevels all pre-Tertiary rocks.

The map-area is underlain by two groups of stratified rocks that are cut by two minor groups of intrusive rocks. The older rocks are those of the Cariboo group which are probably Upper Proterozoic and Cambrian. The Cariboo group is composed of rocks of sedimentary origin that have been regionally metamorphosed to only a low grade yet are highly deformed. The group records a progressive sequence of sedimentation from deposits typical of a stable shelf, massive limestones and quartzose sandstones, to those of an unstable shelf, subgreywackes. The detrital rocks have been metamorphosed and deformed so that they are now phyllites, quartzites, and micaceous quartzites. Hydrothermal activity has markedly altered the appearance of the rocks in some areas.

The younger stratified rocks belong to the Slide Mountain group which is of Carboniferous age. The group is composed of conglomerate, greywacke and slate at the base, chert and argillite above; and basic pillow lavas and pyroclastic rocks are intercalated throughout the section. The group is unmetamorphosed but silicified in part. The chert shows evidence of several origins and much is demonstrably secondary whereas much of the bedded chert may be the result of recrystallization and/or silica reinforcement of initially highly quartzose fine silts.

Periods of intrusion followed both periods of deposition. The Proserpine dykes cut only the Cariboo group whereas the Mount Murray intrusions cut both groups. The Proserpine dykes comprise a few small acidic bodies which are generally highly ankeritized. The Mount Murray intrusions are most numerous in the Slide Mountain group where they occur as diabasic sills. They are commonly much altered, but fresh specimens show the diabases to have spilitic affinities.

The Cariboo group has been intensely folded into tight asymmetric folds trending northwesterly and overturned to the southwest. The deformation has impressed a marked schistosity on all rocks and flattened with no noticeable lineation the larger constituent grains. The lineation resulting from the intersection of schistosity and bedding shows that the folds plunge northwesterly at shallow angles,

but as the Slide Mountain group also plunges northwesterly it is likely that this results from later deformation. In contrast with the Cariboo group the Slide Mountain group is much less intensely deformed. The latter group are folded into a broad synclinorium of which only the western limb is exposed in the map-area. Dips are commonly less than 55 degrees northeasterly except in some of the minor dragfolds. The rocks are rarely schistose. The large difference in degree of deformation between the rocks of the two groups probably indicates that the major folding occurred before the Carboniferous Period. In contrast, faulting appears to have been mostly after the Carboniferous because the large faults disrupt both groups by similar distances. Major faults all strike between north and north 70 degrees east and generally dip steeply eastward. Many are normal faults that thus compensate for the regional northwesterly plunge, however, some of the largest faults are northerly striking right-hand wrench faults.

207 pages. \$2.59. MicA 55-2130

# SEDIMENTOLOGY AND ECOLOGY OF SOUTHEAST COASTAL LOUISIANA

(Publication No. 12,532)

Robert Cuthrell Treadwell, Ph.D.  
Louisiana State University, 1955

Supervisor: Professor James P. Morgan

A deltaic-marine contact is now forming in the coastal area of southeastern Louisiana which can be compared with many similar Tertiary contacts of the Gulf Coastal Plain. Most of this area is an abandoned subdelta of the Mississippi River and is composed of alluvial ridges (natural levees, beaches and cheniers), marsh and water bodies.

The alluvial framework consists of a series of abandoned distributaries radiating and sloping eastward from a focal point at New Orleans. As these distributaries built seaward they deposited characteristic fine-grained sediments which can be divided into six groups based upon grain size, appearance and attitude. These are: prodelta clays, bar sands, natural levee silts and clays, channel fill sands and peats, interdistributary silts and clays and marsh clays and peats.

Sand beaches are essentially confined to an arcuate chain of narrow, low islands which exhibit black mangrove swamp on their soundward side. Indurated sandstone slabs, blocks of delta silt, igneous and metamorphic pebbles, and shells are scattered along the beaches. Sand gives way to oyster shell along the inner margin of the sounds, and clam shell beaches predominate on marshland lake shores.

Stranded gulf beach ridges, or cheniers, of the area are composed of medium sand and were barrier islands before deltaic sedimentation entered the area and isolated them in marsh. Smaller, silty lake cheniers are present in places around the borders of lakes Borgne and Pontchartrain and were formed during periods of delta erosion.

Brackish and salt marshes comprise most land in eastern coastal Louisiana and are a featureless plain rising only a foot or two above sea level. Marsh sediment is composed of organic clay or silty clay and contains thin widespread beds of peat.

In many cases examination of the surface pattern of marshland tidal streams reveals buried natural levees or beaches. These are aids in morphological field mapping. Depth of tidal streams and marshland lakes and bays generally increases with width; however, in tidal streams especially, there are many modifying factors. Largest of the lakes is Pontchartrain, which averages some 15 feet in depth; by far the largest tidal stream is the Rigolets which reaches a maximum depth of almost 100 feet.

Sediments of beaches and water bottoms of St. Bernard Parish have been analyzed for grain size, sorting, shell content, organic content and glauconite and pyrite content. Sediment of the area can be divided into six types: fine, well sorted sand of Chandeleur and Breton island beaches, shell of the marshland beaches, fairly well sorted silty sand and silty clay of the sound bottoms, poorly sorted clayey silt and silty clay of the marshland lakes and shell, silt and clay of reefs. Shell content is generally under 2% except on reefs and shell beaches. Organic content is under 2% in the sounds but rises to 5% in Lake Lery (the inner-most marshland lake). Glauconite is present throughout the area but is never abundant.

Foraminifera and Mollusca distribution has been examined in samples from beaches, marsh and water bottoms. Salinity appears to be the principal factor in controlling the distribution of these forms, although many other factors certainly exert an influence. Four environmental facies and one subfacies are present in the area and each has its characteristic faunal assemblage.

The late Recent developmental sequence of southeastern coastal Louisiana has been reconstructed, and several stages of deltaic and marine advances are postulated. Oldest surface features are the gulf cheniers which date back possibly 5000 years, and the earliest delta in the area is over 2000 years old. The St. Bernard subdelta was certainly well established during Marksville time (500-700 A.D.). Since Marksville, sedimentation and erosion have shifted positions several times with the culmination of delta building occurring in Plaquemine time (1200-1500 A.D.). Shortly after the Plaquemine period the Mississippi River shifted to its present course and marine erosion is now rapidly attacking the land. 206 pages. \$2.58. MicA 55-2131

# A SEDIMENTATION STUDY OF THE BRULE FORMATION IN NORTHWEST NEBRASKA

(Publication No. 12,964)

Paul Charles Tychsen, Ph.D.  
The University of Nebraska, 1954

Adviser: A. L. Lugin

In view of the previous lack of detailed lithologic studies on the Brule formation of Nebraska, this report is an attempt to supply sedimentary constants and characteristics which may be helpful in deciphering the geologic history

and lithologic characteristics of the formation. Particular attention was devoted to the Brule deposits of northwest Nebraska, since faunal studies have been made there, and excellent exposures permit detailed sampling.

A geologic map was prepared of this region, showing the areal extent of the Brule formation. Detailed stratigraphic measurements and lithologic descriptions of good exposures primarily along the Pine Ridge Escarpment, are included in the report.

A size analysis of 71 representative samples revealed very definitely that the greatest percentage of the formation consists of silt size particles. The proportion of silt ranged from a minimum of 56 to a maximum of 93 percent in the examined samples, exclusive of the channel sands. The silt content of the channel sands ranged from a minimum figure of 4 to a maximum figure of 74 percent. The clay and sand content in nearly all of the Brule deposits was sufficiently small to warrant classifying them as a clayey, sandy silt. Laboratory and field analysis indicate the greater bulk of the formation to be homogeneous in appearance and texturally uniform in size. From the evidence cited, it is apparent that much of the Brule formation was subjected to similar sedimentary processes, namely alluvial deposition with much reworking by wind.

Sedimentary constants such as median diameter, quartile deviation, and quartile skewness were determined from examined samples. The greatest value of median diameter in all the channel sands examined occurred at the base of each section suggesting a lag deposit, resulting from the accumulation of coarser materials on the bottom of the channels. The evidence revealed by quartile skewness determinations indicate maximum sorting took place in the coarser grades.

Sphericity and roundness values obtained indicate partial derivation of the sediments from direct weathering of highlands to the west and partial derivation from pre-existing sediments.

Insoluble residue studies indicate calcium carbonate to be a predominant cementing agent, with clay paste acting as a subordinate cement. The abundance of clay pellets noted in the insoluble residue indicate deposition by fluvial agents and are suggestive of the immature nature of portions of the Brule sediments.

Heavy minerals present suggest derivation of the sediments from the weathering of igneous terrain. The angularity of some of the heavy minerals and the presence of unstable minerals such as biotite and hornblende are suggestive of the immaturity of the sediments. Quartz-feldspar ratios obtained bear out this inference. In addition to abundant volcanic glass shards, orthoclase feldspar, plagioclase feldspar, and microcline are the predominant components of the light fraction.

With the aid of X-ray diffraction apparatus and an electron microscope, the predominant clay present in the Brule formation was determined as montmorillonite, with illite and minor amounts of kaolinite. There is a suggestion that not only the Brule but the Chadron formation as well may be predominantly of this clay mineral composition.

The peculiar water-bearing properties, the permeability, and the weathering phenomena of the Brule formation may, in part be attributable to the presence of montmorillonite. Sediments containing montmorillonite are harder, more resistant to weathering, and capable of



absorbing greater quantities of water, but at a slower rate than sediments characterized by a predominance of other clay minerals. 241 pages. \$3.01. MicA 55-2132

**RECENT GEOLOGY AND GEOMORPHIC  
HISTORY OF CENTRAL COASTAL  
LOUISIANA**

(Publication No. 12,534)

Jack Richard Van Lopik, Ph.D.  
Louisiana State University, 1955

Supervisor: Professor James P. Morgan

During the Quaternary great changes have occurred in coastal Louisiana. The processes giving rise to these changes are still operative today. Such modifications are reflected in the sediments laid down during any given time span. In this study an attempt is made, primarily through the interpretation of the sedimentary record, to roughly outline the history of central coastal Louisiana during the preceding 150,000 years. Emphasis is placed on the changes of the last 5,000 years.

An omnipresent factor in the interpretation of the history of central coastal Louisiana is the shifting position of the ancestral Mississippi River. After studying the characteristics and deposits of the present Mississippi, it is possible to assign ancient sediments to positions relative to the previously existing major streams. Thus borings are of great importance in determining ancient environments and the then existing coastal configurations. A cultural chronology, based on Indian artifacts, has proven very helpful in establishing the relative ages of various streams. In addition, surficial evidence, as indicated on aerial photographs, is often of value in determining the mode of origin of various surfaces, establishing the relative ages of streams, and in tracing old stream courses. A combination of borehole information, cultural evidence, and surficial expression thus enables a fairly complete picture of ancient conditions and changes to be drawn.

Deep borings indicate that entrenchment of the Gulf Coast streams, and subsequent refilling of the troughs, has occurred twice within the last 150,000 years. This entrenchment and refilling was a result of major fluctuations in sea level caused by expansion and contraction of polar ice sheets. Shallow borings, cultural evidence, and surficial expression makes it possible to decipher much

of the complex physiographic history of central coastal Louisiana since the filling of the most recent trenches. In addition, similar evidence plus the position of former beaches makes it possible to formulate a sequence of Mississippi River delta shifts during the last 2,500 years.

It is hoped that the methods used in interpreting the history of this region will find application in similar deltaic areas throughout the world.

245 pages. \$3.06. MicA 55-2133

**RECENT SEDIMENTS IN PUGET SOUND  
AND PORTIONS OF WASHINGTON SOUND  
AND LAKE WASHINGTON**

(Publication No. 13,007)

Feng-Hui Wang, Ph.D.  
University of Washington, 1955

Based on environmental occurrence, grain size distribution, carbonate content, and water content, the sediments of Puget Sound, Washington Sound, and Lake Washington are classified into the following types: shelf sand, slope sand, depositional channel sand, residual channel sand, basin mud, basin mud rich in sand grains, basin sand with mud matrix, lake mud, compacted glacial clay, and dumped materials.

Factors governing water content, salinity of interstitial water, clay ratio, and carbonate content are evaluated. This analysis shows that the carbonate content of the sediments depends on (1) the rate of lime deposition, chiefly as benthonic shell fragments, foraminifera tests, and fine calcareous particles of uncertain origin, (2) the rate of deposition of non-calcareous clastic materials, and (3) the rate of solution of carbonate in the sediments.

A deficiency of granules, coarse sand, and coarse silt in Puget Sound and Lake Washington sediments is explained by sediment transport and the composition of parental glacial deposits.

Streams and shoreline erosion supply annually about  $33.5 \times 10^5$  metric tons of sediment to Puget Sound, of which about three-quarters is deposited in the Sound at an estimated average overall rate of 0.6 mm per year, and about one-quarter is carried out into the open sea. Puget Sound sediment distribution shows both normal and reverse sediment by-passing as a consequence of the variable currents. 174 pages. \$2.18. MicA 55-2134

## HEALTH SCIENCES

### HEALTH SCIENCES, GENERAL

#### THE USE OF COCOA SYRUPS FOR MASKING THE TASTE OF QUININE HYDROCHLORIDE

(Publication No. 12,781)

Arthur Wauchop Reid, Ph.D.  
The University of Florida, 1955

Some investigations have been made to evaluate the use of imitation flavors for disguising the taste of distasteful drugs, and the official cocoa syrup has been found the best vehicle for masking the taste of quinine hydrochloride. This investigation was made to determine whether a new formula or method of preparation, or both, would improve the flavor or produce better masking power for obnoxious tasting drugs over cocoa syrup, U. S. P.

The official formula and method of preparation were varied by the addition of flavors, the use of different types of cocoa and different temperatures. These changes did not improve the vehicle, as measured by taste preference. The official syrup was judged superior in flavor to most variants tested and the equal of any. The changes did improve the disguising power for quinine hydrochloride. Ten of the eleven cocoa flavored vehicles tested were significantly better disguising agents than the official syrup. The three with the highest disguising potentials were made from Dutch process cocoa. The first contained added salt. The second was made by mixing cocoa with sugar-gelatin solution at room temperature. The third contained imitation butterscotch flavor. It was also found that all eleven of the cocoa flavored vehicles studied were significantly better disguising agents than syrup, U. S. P.

61 pages. \$1.00. Mic 55-273

### HEALTH SCIENCES, PHARMACY

#### A STUDY OF SOME FACTORS INFLUENCING THE STABILITY OF PHARMACEUTICAL EMULSIONS

(Publication No. 12,779)

John Dolan Mullins, Ph.D.  
The University of Florida, 1955

The stability characteristics of oil-in-water emulsions were investigated. Four oils and two emulsifying agents were used. By the use of a size frequency method of analysis to evaluate emulsion stability, the variation of specific interfacial area with time was obtained. Results indicated that emulsion deterioration was influenced by homogenization pressures, type of emulsifier, and, to a lesser extent, the type of oil constituting the internal phase.

The effect of homogenization pressure on emulsion stability was studied. To obtain the required pressures a Manton-Gaulin two-stage homogenizer was used. Stability and specific interfacial area increased with increased homogenization pressure. The latter increased at a constant rate for each oil. Changes in homogenization pressure had no effect on emulsion viscosity.

The effect of beeswax added to the internal phase was studied. Results indicated that this addition did not contribute to emulsion stability.

To investigate the effect of specific gravity on emulsion stability, emulsions were prepared in which the specific gravity of the internal phase was adjusted to equal that of the external phase. This adjustment was accomplished by the addition of brominated oil. Results indicated that adjustment of specific gravity increased stability in emulsions stabilized with one of the emulsifying agents. In other emulsions stability was not increased. In both instances specific interfacial area was decreased. The viscosity was not influenced.

177 pages. \$2.21. MicA 55-2135

#### THE EFFECT OF VARIOUS SUBSTANCES ON THE ANTIBACTERIAL ACTIVITY OF ERYTHROMYCIN IN OINTMENTS

(Publication No. 12,786)

Randall Bradford Tinker, Ph.D.  
The University of Florida, 1955

Whether a specialist or general practitioner, the physician often encounters infections in which he would like to prescribe a particular antibiotic substance in conjunction with some other medicinal agent for topical application. He is, however, reluctant to do so because of the lack of specific information regarding the efficacy of the particular combination or mixture which he wishes to prescribe.

The effect of various official ointments employing a petrolatum-type base upon the antibacterial activity of erythromycin was investigated using the agar disc-plate method with *Micrococcus pyogenes* var. *aureus* (ATCC 10,537) as the test organism. The test plates were incubated at 35 - 37° C. for a period of 20 - 22 hours in these *in vitro* tests.

The antibacterial activity of erythromycin was determined to be significantly enhanced when the antibiotic was mixed with Ammoniated Mercury, Benzoic and Salicylic Acids, Calamine, and Mild Mercurous Chloride Ointments. No significant effect was shown when the antibiotic was mixed with Mercury Bichloride, Yellow Mercuric Oxide, and Zinc Oxide Ointments. Erythromycin should not be mixed with Boric Acid, Ethyl Aminobenzoate, or Red Mercuric Oxide Ointments for the antibacterial activity was found to be significantly reduced.



It was shown in the course of the investigation that little if any, difference in the antibacterial activity was evident whether or not the medicinal agents of the official ointments were present in the official ointment base or in white petrolatum. Non-ionic, cationic, and anionic surfactants were shown to have no effect upon the antibacterial activity of erythromycin.

There was no significant difference in the antibacterial activity when the ointments were stored at room temperature or under refrigerated conditions at approximately 5°C. Similarly, neither variation in consistency of the ointments nor differences in the type of container (glass and opal ointment jars or collapsible ointment tubes) had a significant effect on the antibacterial activity of the erythromycin.

77 pages. \$1.00. MicA 55-2136

## HEALTH SCIENCES, PUBLIC HEALTH

### A STUDY OF THE TOXICITY OF DICAPRYL DIGLYCOLLATE

(Publication No. 12,945)

James DeWayne Thornton, D. S. I. M.  
University of Cincinnati, 1955

Dicapryl diglycollate has been proposed for use as a plasticizer. The basic chemical and physical properties of plasticizers in their relation to plastics are reviewed in the introduction.

The purpose of this study was to determine the toxicological properties of the chemical and to make suggestions as to what hazards may be expected in its

processing and to what public uses the finished product will be suited.

The approximate lethal dose of diglycollate when given orally in one dose is 0.28 ml/kg for rabbits and 2.1 ml/kg for rats.

No signs of intoxication were seen in four rabbits which were each given 0.035 ml/kg dicapryl diglycollate on each of five days per week for 10 weeks. Similarly, 0.17 ml/kg of the plasticizer was administered orally to rats for 10 weeks without signs of intoxication.

The ALD of dicapryl diglycollate for rabbits when kept in contact with the intact and abraded skin for 24 hours (sleeve method of Draize, et al.) is 1.43 ml/kg. Three rabbits survived when the dosage of 0.5 cc was maintained on their skins for two hours on each of five days per week over a period of ten weeks.

In order to determine the part the alcohol radical played in the toxicology of dicapryl diglycollate, the capryl radical was replaced by 3-5 dimethyl hexanol, leaving the diglycollate intact, resulting in the synthesis of di-isooctyl diglycollate. The ALD of this chemical when given orally in one dose was 0.62 ml/kg for rabbits and 2.1 ml/kg for rats.

The dicapryl diglycollate molecule was again altered, leaving the alcohol radical intact and replacing the glycollate with a phthalate radical, thereby forming dicapryl phthalate. The ALD of dicapryl phthalate when given orally in a single dose was greater than 24.0 ml/kg for both rabbits and rats.

From the foregoing data, it appeared that most of the toxic properties shown by dicapryl diglycollate were due to the diglycollate radical.

The plasticizer is considered safe for use in all plastics except those which may come into contact with food. One of the greatest hazards in processing the plasticizer is that involving the skin of the workers.

115 pages. \$1.44. MicA 55-2137

## HISTORY

### HISTORY, GENERAL

#### THE GROWTH OF THE AMERICAN CITY, 1830 TO 1860; ECONOMIC FOUNDATIONS OF URBAN GROWTH IN THE PRE-CIVIL WAR PERIOD

(Publication No. 11,952)

Elliot Alfred Rosen, Ph.D.  
New York University, 1954

Adviser: Professor Bayrd Still

The years between 1830 and 1860 witnessed a marked increase in the number and proportion of persons living in urban centers in the United States. In 1830, there were 1,127,247 persons, or 8.8 percent of the population who lived in ninety urban places of 2,500 or more. By 1860, there were 6,216,518 urban dwellers in the nation,

constituting 19.8 percent of the total population, and urban places totaled 392. Obviously, while there were those who sought farms in this era, there were also millions who were establishing new homes and finding a livelihood in America's growing cities. The period between 1830 and 1860, then, constitutes the first chapter in the story of the modern American city.

Urban development between 1830 and 1860 rested upon certain basic economic foundations. Of prime importance was the expansion of trade and commerce. This was a period of increase in the foreign trade of the United States and one in which the American merchant marine enjoyed an importance on the shipping lanes of the world which it never before had known, developments from which the nation's seaports, especially, benefited. At the same time, the expansion of coastwise trade, the construction of canals and railways, the development of steam navigation on the inland waterways, and the advance of settlement into the Old Northwest and the Old

Southwest created an enormous domestic traffic which not only expanded the hinterland and commerce of the country's seaports, but led, also, to the rise of inland commercial centers located on the major avenues of commerce--the Erie Canal, the Ohio and Mississippi rivers, and the Great Lakes. The merchants of coastal and interior cities sought to carve out for themselves as large a commercial hinterland as possible, to channel through their cities as large a share of this growing trade as they could; and the growth of a particular city (or a group of cities) often depended on how large a hinterland it could command.

Another factor both causing and supporting urban growth was the increase in manufacturing which occurred in the pre-Civil War period. The construction of canals and railroads and the development of the steamboat speeded up and cut the cost of freight shipments, made raw materials available to manufacturing centers, and expanded the market of the growing manufacturing centers of the nation. In addition, the total growth and westward movement of population opened up new markets; and the development of water power and steam power and the improvement of marketing techniques also stimulated industrial growth and urban concentration. Finally, and of great importance, not only did the number of persons employed in manufacturing centers increase absolutely, but each decade saw a greater proportion of the manufacturing product of the nation being turned out in the country's growing urban centers. Developments occurred in the evolution of several important industries which necessitated a greater outlay of capital, a larger plant, and more specialized skills than had hitherto been used; and these developments contributed to the increasing concentration of manufacturing in urban areas.

New England was relatively the most urbanized section of the United States, and the urban expansion which occurred in the section between 1830 and 1860 was largely a consequence of the development of manufacturing. Not only did manufacturing contribute to the rise and growth of the section's interior cities, among them, Lowell, Lawrence, and Manchester, but many of its older coastal communities, such as Salem, Providence, and New Haven, also turned to industry for their economic and population advance. Domestic commerce, closely connected with the rise of manufacturing in New England, was also important in the advance of Boston, Providence, Worcester, and other towns and cities.

By 1860, there were more urban dwellers in the Middle Atlantic States than in any other section, for the value and volume of commerce and manufacturing were greatest in this area. Foreign, coastwise, and internal trade contributed to the advance of its great coastal centers--New York, Philadelphia, and Baltimore; and internal trade aided in the development of interior communities such as Albany and Rochester. Though commerce appears to have been the major factor in urbanization in this section between 1830 and 1860, manufacturing assumed increasing importance. In some places, among them Philadelphia, Troy, Rochester, Utica, and Wilmington, manufacturing probably displaced commerce, before 1860, as the major factor in urban development; and Newark and Paterson arose mainly as manufacturing communities.

The Southern States experienced the smallest urban advance of any section in the nation between 1830 and 1860. Commerce was the predominant factor in urban growth, but for various reasons, among them, the dependence upon Northern ports for imports, the lack of a great coastwise

trade, and the failure to capture the growing trade of the West, the commercial centers of the South were not as large as those of the North. The absence of a significant manufacturing development, with the exception of Richmond, also explains why the urban advance which was made in the South between 1830 and 1860 did not equal that of the Northeast.

On the other hand, urban growth was rapid in the Western States between 1830 and 1860, notably on the Ohio and upper Mississippi rivers and on the shores of the Great Lakes. The river cities enjoyed population superiority over the lake cities down to 1860 for several reasons: their hinterlands had been settled earlier; the river cities were the earliest commercial centers of the trans-Appalachian West; and they were the most important manufacturing centers of the region before 1860. By 1860, commercial supremacy had shifted from the river to the lake cities; and between 1850 and 1860 the lake cities grew more rapidly. Yet, the river cities maintained manufacturing and population superiority to 1860.

Finally, the settlement of the Pacific Coast area, primarily in the decade of the fifties, led to the beginning of urban growth in that region. By 1860, San Francisco emerged as the principal urban center in the area, mainly because of the foreign, intercoastal, and domestic trade which developed between 1850 and 1860. The years between 1830 and 1860 thus witnessed a significant urban development in the United States. Though the majority of Americans still lived in a rural setting, the rise and growth of cities in this period was such as to lay the foundations of our contemporary urban civilization.

391 pages. \$4.89. Mic 55-274

## HISTORY, MODERN

### A STUDY OF SMALL-TOWN LIFE IN THE TEXAS CATTLE COUNTRY, 1880-1890, AS REFLECTED IN THE PRESS OF THE AREA AND PERIOD

(Publication No. 13,313)

Warren Kendall Agee, Ph.D.  
University of Minnesota, 1955

What was it like to live in a small town in the Texas cattle country some seventy years ago? How did one make a living, maintain law and order, educate his children, keep healthy, find recreation, worship God? What were the social organisms and forces affecting, and affected by, the inhabitants and casual residents of the communities? How did the region as a whole react to outside influences, political, economic, and social? What was it really like to live in a West Texas town during the decade of the 1880s?

This study is an attempt to find out the answers to these questions and others through the examination of the press of a typical Texas country area in the decade.

The newspapers studied were the Rural Citizen and its successor, the Gazette, in Jacksboro, Jack County, and the Echo, Star, and News in Albany, Shackelford



County. A newspaper published at Abilene, the Taylor County News, was selected for less intensive study. Other primary sources, including legal and business records, census reports, and diaries, also were examined, both to amplify and to check the veracity of the newspaper materials.

Some of the methods and techniques of both the historian and the sociologist have been utilized. Aspects of community life have been considered under such headings as government, religion, and the family. In addition, some of the sociologist's techniques of analyzing community life have been incorporated in a summary, interpretative chapter, a study of social interaction.

The press reveals that the economic basis of Texas cattle country towns in the 1880s represented the functioning of an acquisitive, exploitative, profit-making, highly competitive society. The people were individualistic and self-reliant, yet they turned by necessity to cooperative effort to achieve economic and political ends. Characterized as "radical" by Eastern interests because of their resistance to economic and political subordination by an encroaching industrial and financial order, these West Texans nevertheless possessed traditional conservatism in their opposition to change.

West Texans resisted the infiltration of folkways and mores not their own. Technological developments, however, found ready acceptance. Bound together by ties of an historic, climatic, economic, and geographic nature, West Texans early developed a definite sectional spirit. An inclination toward anti-intellectualism was almost counter-balanced by adherence to the traditional American faith in free public schools.

If the newspapers accurately mirrored the community, mind, then the people were immensely preoccupied with purely local and sectional developments. Philosophically, it appeared that little disturbed the general state of mind.

Press materials indicate that social contacts were largely of the primary, face-to-face type. Class consciousness was not conspicuous, but a definite social stratification could be observed. Social mobility, both vertical and horizontal, was a characteristic of the society. Social control was achieved principally through the informal pressures of folkways and mores, supported by institutions such as the family, church, and school.

Combining historiography with certain insights and techniques of sociology in this study contributed to a greater understanding of the way of life of West Texas townspeople during the decade than might have been gained through adherence to one discipline only.

A knowledge of journalistic practices also proved useful in assaying the validity of the newspaper data gathered. An analysis of the data indicates both the usefulness and the limitations of the press as a social document. The press proved to be the best single source through which to gain insights into the life of the area and period, although it was necessary to utilize other primary source materials to obtain a rounded picture.

427 pages. \$5.34. Mic 55-275

## SPANISH FLORIDA IN AMERICAN HISTORIOGRAPHY, 1821-1921

(Publication No. 12,774)

Ray Eldred Held, Ph.D.  
The University of Florida, 1955

The cession of Florida to the United States in 1821 marked the end of the Spanish era which had begun with the discovery in 1513. During these three centuries Florida was a region changing in size. At various times it extended as far north as Virginia and as far west as Louisiana, but by 1821 it was reduced to the area of the present state. The object of this investigation was to determine what Americans had accomplished, in the first century after 1821, toward writing the history of Florida under the Spanish regime.

The first American "histories" of Florida were brief sketches within general treatises on the territory, and they emphasized only the major explorations and a few military and political events. There were better histories for some of the other southeastern states, but they revealed little knowledge of Spanish enterprise within their borders. The national historians failed to cover the subject completely, too, for in the early nineteenth century the necessary materials did not exist in the United States. Gradually old editions of the Spanish historians and new collections of primary sources became available, but these were not fully utilized.

The first important contributions appeared in the generation between the 1850's and the 1880's. The anthropologist Daniel G. Brinton included in his archaeological study of Florida a remarkable bibliographical essay on its historical literature. Buckingham Smith translated and edited several important sources from the sixteenth century, and also made a collection of transcripts from Spanish archives. George R. Fairbanks wrote the first genuine history of Florida, in which he gave major consideration to the years before 1821. John Gilmary Shea described the Catholic missionary activity in the Southeast.

In the closing years of the nineteenth century and the first two decades of the twentieth, there were few important developments. In Florida the historical sketches were based upon Fairbanks, with little that was new. In the neighboring states historians, even in 1921, were not fully aware of the early Spanish activity, although the wide range of the De Soto expedition had long been known and steps had been taken in Alabama and Mississippi to study the last years of Spanish control. On the national level the only outstanding work was that of Woodbury Lowery who, at the turn of the century, made a collection of archival material and issued two volumes of a projected series on the Spanish settlements within the United States. None of the academic historians of the early twentieth century specialized in Spanish Florida, but the subject profited from the general concern with locating and printing primary materials for American history. A promising development at the very close of the period under survey was Herbert E. Bolton's emphasis upon the role of Florida as part of the "Spanish borderlands."

Throughout the years from 1821 to 1921 American histories considered the Spanish activity in sixteenth century Florida as a prelude to the development of Anglo-Saxon America, with the De Soto expedition and the

intrusion of the French Huguenots receiving the most emphasis. Otherwise the province was treated only as an exterior factor, a border problem for the southern English colonies and the young American republic. There was, throughout the period, an improvement in accuracy of basic data; and there were noteworthy discoveries concerning the geographical extent of exploration, attempted colonization, and missionary enterprise. Nevertheless these were not widely disseminated. General knowledge of the subject remained little changed, and in 1921 emphasis was still placed upon those episodes whose outlines were known a century before. 374 pages. \$4.68. MicA 55-2138

**THE ARMY AND STEPHEN WATTS  
KEARNY IN THE WEST, 1819-1846**

(Publication No. 13,330)

Willis Boldt Hughes, Ph.D.  
University of Minnesota, 1955

The purpose of this study is to examine the problems that confronted regular army commanders on the Western frontier and the manner in which those problems were met. It is an account of the obstacles and difficulties of unit command and of the limitations under which units had to operate. This paper is a part of the story of the United States Army on the trans-Mississippi frontier during an important phase of American westward expansion in the period between the War of 1812 and the Mexican War.

During that westward movement the Army was the direct instrument of governmental frontier policy and officers, as troop leaders and administrators, were responsible for the execution of instructions received from higher authority under the policy of the moment. One result was frequent and bitter collisions between military commanders obeying orders from Washington and civilians residing on the frontier. There was constant danger of trouble between the settlers and the Indians; between the Indian tribes themselves, and between the Army and the Indians. Furthermore, military personnel was sometimes harassed by traders, settlers and frontier politicians whose interests ran counter to executive directions from Washington or to laws duly passed by Congress. In addition, the slowness of the mails and the possibility of there being a reversal of policy, particularly after a change of administration, caused military commanders to operate in an atmosphere of some uncertainty.

Aside from these problems of adapting military policies to the West as it was in this period there was the task of operating in the field. There were the constant problems of discipline involving among other things the inhibiting of desertions. There was the duty of recruiting men and that of preserving the health of the troops. Routes across a terrain still more or less unknown had to be mapped; forts built, supplies transported from distant depots, fuel cut and hauled, government farms laid out and cultivated for the provisioning of the troops, and a maximum amount of badly needed military training had to be given. None of these problems were eased by the Congressional requirement that strict economy always be observed, or by the difficulties then existing in the procurement and distribution of technical equipment; in the allocation of the services of skilled personnel, or by the assignment of company

officers to detached service with little regard to the needs of their units. At the same time the uncertainty of communications hindered operations of all kinds. As if that were not enough, the military was required to police the Indian country and to expel white trespassers and whiskey peddlers from Indian lands pursuant to the terms of the Indian Trade and Intercourse Acts and the several treaties with the various tribes. The fact that local courts could, and did, nullify acts of Congress on occasion, or penalize officers for doing their duty, was significant because it showed beyond a shadow of a doubt where the real power lay among the white men on or near the fringe of settlement.

This study is an effort to write the story of this period in the military history of the United States and to describe the part played by the regular army on the plains before the Civil War. 555 pages. \$6.94. MicA 55-2139

**DAVID LLOYD OF PENNSYLVANIA  
1686-1731: ADVOCATE OF  
LEGISLATIVE SUPREMACY**

(Publication No. 12,997)

Roy Norman Lokken, Ph.D.  
University of Washington, 1955

David Lloyd, Pennsylvania's foremost advocate of legislative supremacy during the first half-century of its existence, was either ignored or belittled as a "demagogue" by eighteenth and nineteenth century historians. Recent historians, however, have come to regard him as a key political figure in early eighteenth century colonial America. Unfortunately, they have interpreted him as a "democrat" or "republican" who opposed royalty and consciously lay the foundations for later Jeffersonian republicanism. The purpose of this thesis is to provide a more balanced interpretation of Lloyd, to present in perspective his political ideas, conduct, and motivations, and to show his real significance in the changing colonial scene during the years of his life.

Born in North Wales in 1656, Lloyd was early subjected to the influences of his Quaker kinsmen. He studied law in England, and became one of William Penn's London lawyers when one of his Quaker kinsmen was associated with Penn in the colonization of Pennsylvania, a proprietary tract in America which Penn had acquired from Charles II in 1680/81. In 1686 Lloyd migrated to America with Penn's commission as Attorney-General of Pennsylvania. Until 1688 he represented Penn dutifully and endeavored to further proprietary interests in the colony.

After 1688 Lloyd's acquisitions of large amounts of land brought him into conflict with Penn and his agents in matters of land policy. Lloyd identified himself increasingly with the local interests and aspirations of the colonists and became politically anti-proprietary. When Pennsylvania was temporarily under a royal governor, he represented and furthered the colonists' interests as the Speaker of the Assembly. After the passage of the Navigation Act of 1696 he opposed the Crown when he thought that the Crown's court of vice-admiralty threatened to upset the economic life of the colony. He



subsequently changed his mind, but his opposition to the vice-admiralty court nearly ruined him. The Board of Trade and the Lords Justices of England ordered Penn to remove Lloyd from all public offices, and Lloyd never again received a commission from Penn.

Barred from commissioned offices, Lloyd thereafter appeared on the political scene as a popular leader, elected representative, and Speaker in the Pennsylvania Assembly. From 1701 on he strove to reform the executive, legislative, and judicial branches of the Pennsylvania government so as to increase the power of the Assembly in all provincial matters. At the same time he endeavored to minimize proprietary influence by excluding the Council from the legislative authority and by rendering proprietary agents administering land policy subject to the Assembly. His efforts were vigorously opposed by Penn, his Deputy Governors, and the Council, but Lloyd succeeded in most of his aims when he finally achieved for the Assembly the power of the purse over executive and judiciary offices and when he obtained the cooperation of a friendly Deputy Governor.

Lloyd's political antipathies were chiefly anti-proprietary and not anti-monarchical. He sometimes evinced a preference for royal government in the colonies rather than proprietary government, and his writings show that he believed the King to be the matrix from which all English liberties were derived. Lloyd's political purpose was to promote the local interests of the colonists and the powers of their Assembly. In carrying out his purpose, he created laws and institutions which were novel in his time, including a Supreme Court which had an exclusively appellate jurisdiction and a unicameral legislature. When he died in 1731, he had no idea that the ultimate consequence of his actions and of parallel developments in other colonial Assemblies was to be a conflict between the English Parliament and the colonial Assemblies and a Revolution in which the King of England was to be condemned by Americans as a tyrant and despoiler of popular liberties.

450 pages. \$5.63. Mic 55-276

#### HUMANITARIAN OPPOSITION TO THE ECONOMISTS ON THE POOR LAW AND FACTORY LEGISLATION, 1802-1847

(Publication No. 13,044)

Howard Mackey, Ph.D.  
Lehigh University, 1955

The purpose of this study was to determine the importance of the interplay of economic and humanitarian opinion on factory and poor law legislation. Social and economic conditions made action imperative, and the humanitarians and economists led in formulating opinion designed to alter those conditions.

The economists argued from economic principle. They opposed the old poor law on the basis of Malthus' theory of population. They denied that poor relief was a charity, and they attacked Christian charity itself. They employed the economic principle of non-interference in opposing the amelioration of the factories. They believed that factory legislation could not be effective, and that it endangered capital.

In contrast to the rationalism of the economists, the humanitarians were governed by their feelings. They were motivated by the evangelical revival of the eighteenth century. The concepts of Christian charity and Christian love made them the primary proponents of factory regulation. The majority of them opposed the poor law. They believed in active Christian charity, but they did not regard poor relief as charity. They felt that the poor law encouraged immorality and prevented the free expression of charity.

The results of the interaction of economic and humanitarian opinion were numerous. Parliament passed the Poor Law Amendment Act in 1834. Although it did not abolish poor relief, the New Poor Law did eliminate the humanitarian aspects of the old law. A victory for Malthus and the economists, the New Poor Law could never have passed except with the support of the majority of the humanitarians. Some humanitarians, however, opposed the passage and operation of the new law.

Not united on the issue of the poor law, the humanitarians concurred entirely on factory legislation. In 1802 they secured legislative protection for parish apprentices through Sir Robert Peel's Act. They desired legislative protection for all children, and in 1815 they supported Peel's second bill. The economists opposed the bill on the grounds of non-interference, asserting that the children were free agents. The humanitarians denied both arguments, and succeeded in passing Peel's bill in 1819.

The Act of 1819 failed to give the protection the humanitarians had hoped for. They deplored factory conditions, and after 1830 they joined in agitating for a ten hour bill. Led by Michael Thomas Sadler, and later by Lord Ashley, the agitation was evangelical in character. The economists again stood on their principles, and opposed factory legislation on the grounds of non-interference. The agitation aroused by the ten hour movement, however, was of such magnitude that the economists could not prevent legislation entirely. They succeeded in defeating the ten hour bill in 1833, and in substituting a bill more amenable to their principles.

The Factory Act of 1833 failed to achieve the ends its authors had desired, and it failed to dissipate the ten hour movement. When the failure of the Act became apparent the ten hour movement again became active. The economists reasserted their principles and predicted the destruction of industry and foreign trade if the bill passed. The humanitarians, however, insisted that the factory children could not be adequately protected except by a ten hour bill. In 1847 they secured its passage.

The issue of the poor law and factory legislation had been resolved through the interplay of economic and humanitarian opinion. Neither issue was taken up by the major political parties, and the support and opposition of both was not political in nature. The conflict of humanitarian and economic opinion had produced results which were to be felt by generations of Englishmen.

238 pages. \$2.98. Mic 55-277

**THE EARLY STUARTS AND THE  
ENGLISH PEERAGE (1603-1649)**

(Publication No. 13,337)

Charles Ray Mayes, Ph.D.  
University of Minnesota, 1955

Adviser: David H. Willson

At Elizabeth's death in 1603 the English peerage, which had enjoyed little net increase for several centuries, numbered fifty-nine. But the advent of the Stuart dynasty resulted in a rapid enlargement of the nobility and a significant debasement of honor generally, as 127 new peers, many of whom were considered socially inferior, were created.

The causes of such unprecedented largess of honor were varied. In the first years of his reign James I ennobled many of his own allies as well as a number of Elizabeth's outstanding servants, various magnates of the realm, and men of high professional attainments. If excessive, these early creations were generally commendable, but rule by favorites soon presaged a vulgarization of honor distinctly unpalatable to the older aristocracy. Although Somerset's jealous control of patronage brought a lull in the distribution of honor during the middle years of the reign, the appearance of a new favorite at court in 1615 inaugurated an even greater flood of creations. The Buckingham era, 1615-28, produced fifty-seven new English peers and promotions for many others, as titles of nobility were put up for sale, more than a dozen of the favorite's kindred were ennobled, and efforts were made to strengthen the court party in the House of Lords. A marked retreat in the bestowal of honor during the years of Charles I's personal rule, 1629-40, was followed by the decade of the Long Parliament and Civil War when, as a means of winning support, the crown again resorted to an excessive distribution of honor.

Concomitant with the rapid growth of the English peerage was a similar accretion of the nobility in Ireland and Scotland. The enlargement of the Irish peerage became a pronounced phenomenon after 1615 when titles were sold, Buckingham partisans were rewarded, and there began a deliberate infiltration of loyal Englishmen, many of whom had neither land nor political connections in Ireland, into the Irish nobility. In Scotland, however, the growth of the peerage had begun in the sixteenth century in the wake of the Reformation, and after 1603 this process was merely quickened, with less evidence of serious degradation of noble rank.

While the early Stuarts were enlarging, and substantially debasing, the peerage, they were degrading other degrees of honor. More than thirty-five hundred knights bachelor and 190 Knights of the Bath were created during the two reigns, some having purchased their titles and many being neither socially nor economically equipped to bear them. Knightly ranks were further disturbed by the institution of the Order of Baronets, representing frankly marketed titles.

The careless manipulation of honor, pronounced prodigality with the crown's resources, and official corruption prevalent at the early Stuart court were major causes of a growing resentment of the crown. The reckless and often venal distribution of titles outraged the sensitivities of many members of the upper classes, engendered virile opposition in the Lords, and strengthened the existing opposition in the Commons. This effect was heightened as

the crown admitted to its highest counsels members of the new to the general exclusion of the older nobility. Moreover, by ennobling most of those who served in ministerial or cabinet capacity, the crown lost the initiative in the lower house because it lacked able leaders of royal policy there. Quarrels over matters of precedence among titled subjects of all three kingdoms further aggravated the already strained relations between crown and country. There is little doubt that early Stuart policies affecting the peerage, particularly in England and Ireland, contributed significantly to the ultimate clash of arms between crown and parliament.

467 pages. \$5.84. MicA 55-2140

**COURT CASES INVOLVING SLAVERY:  
A STUDY OF THE APPLICATION OF  
ANTI-SLAVERY THOUGHT TO  
JUDICIAL ARGUMENT**

(Publication No. 12,643)

Kempes Yoder Schnell, Ph.D.  
University of Michigan, 1955

The purpose of this study was to discover how the American Anti-Slavery Society attempted to use the nation's courts to its advantage in the period before 1860, and to show how this usage changed the pattern of court cases involving slavery and the Negro which had developed prior to 1833. The scope of the study includes all court cases involving the Negro in both state and federal courts to 1860, with especial attention given to the arguments of the anti-slavery and pro-slavery and pro-slavery lawyers. This complete scrutiny was necessary because the purpose of the study was to determine the evolving trend of constitutional argument, and not to discover the actual state of the law at any particular time.

All available secondary sources which involved a study of the legal status of the Negro were employed as background material. Primary sources used formed two principal categories: state and federal court reports, and the contemporary pamphlet publications of both the anti-slavery and the pro-slavery advocates. For the purpose of organization the relevant court cases were classified into five major types: (1) cases initiated to attack or protect anti-slavery workers; (2) cases involving the right to freedom of slaves who were carried by their master into free states; (3) cases involving the legal status of free Negroes; (4) cases concerning the question of the fugitive slave; (5) criminal and civil suits against persons who aided fugitive slaves in their escape.

The constitutional and legal concepts of this period cannot be interpreted simply, as though the North was entirely anti-slavery and the South solidly for secession. Both sections had a large segment of moderate people who were not radically inclined toward either extreme until war actually broke out, but who were sincerely attempting to find an equitable solution to the problem of slavery and the Negro. Besides this the anti-slavery picture is confused by the presence of more than just one anti-slavery program. Especially prominent were the mid-western group in control of the American Anti-Slavery Society until 1839, and the Garrisonian reform movement centered in New England.



The American Anti-Slavery Society was primarily a reform agency which had as its purpose to abolish slavery in the entire nation, and to educate the Negro, thus freed, to take his place in civilized society. Its program was national; its philosophy knew no discrimination on the basis of race. On these two premises alone can the role of the American Anti-Slavery Society in the nation's courts be properly understood. They explain the changes in the court cases involving slavery which occurred after 1833. Before 1833 the numerous litigations involving the Negro had been predominantly on a localized scale, set primarily in the state and county court. These early cases had set up no standard for interpretation, but had resulted in numerous conflicting decisions. To 1833 federal courts had uniformly tended to shun jurisdiction over questions concerning the Negro and slavery although nearly every case had clearly federal implications. These cases had been argued by friends of the Negro on the basis of natural law, but not on the basis of constitutional rights.

The court cases initiated by the American Anti-Slavery Society resulted from the inability of the society to abolish slavery, or to aid the free Negro, by federal legislation. The ultimate purpose of this litigation was to undermine the constitutional basis of slavery and to hasten national abolition. The arguments now used equated natural law with the Constitution, and applied the principles of the Declaration of Independence to every interpretation of the Constitution. These arguments insisted that the traditional rights of white men must be applied to the Negro, because the Negro was denominated a person in the Constitution. These arguments were often legal innovations, with less traditional, national support than the southern argument, but they were in tune with the needs of the evolving industrialism of the North. Their use was made possible because the northern state laws since abolition had been increasingly inclining toward the extension of the law of the white man to the Negro.

These cases became extremely significant because they finally forced the Supreme Court to take cognizance of the slavery controversy. 359 pages. \$4.49 MicA 55-2141

**PATRIOTIC PROPAGANDA AND THE  
DEVELOPMENT OF THE CALVINIST  
PARTY IN THE NETHERLANDS, 1576-1581**

(Publication No. 12,661)

Elmer Lawrence Van Ryn, Ph.D.  
University of Michigan, 1955

During the Eighty Years' War for independence from Spain, control of that part of the Lowlands which was successful, the United Provinces of the Netherlands, was obtained by a small Calvinist minority. Among the more important factors which contributed to this result was the religious problem. The integrated politico-religious policy of Philip II in the Netherlands forced the Calvinists there to become his implacable enemies; they could not agree

to his demand for the sole exercise of the Roman Catholic religion. At the same time a great part of the Catholic population of the provinces objected to the Spanish King's secular aims: centralization of the government, standardization of local rights and privileges and use of the resources of the Lowlands in pursuit of his far-flung goals. If the Dutch revolt against Spanish domination was to succeed, it was imperative that Calvinist and Catholic patriots cooperate against Philip II. Since the Calvinists were the foremost foes of the King this problem was largely theirs; they had to obtain the help of their religious rivals against him. One of the methods to this end employed by the Protestants and their patriotic Catholic friends was the use of propaganda.

This study reviews the pamphlet literature of the patriots of the Netherlands during the period 1576-81, when the Calvinists made their most impressive gains and those Roman Catholics most likely to resist their influence were reconciled with the King. The patriotic pamphleteers vilified their enemies and praised their friends, pleaded for religious tolerance, and decried dissension and division. To unite the people of the Netherlands in opposition to their common Spanish foe, the nationalistic propagandists stressed the "evils" which foreign rule had brought and would bring them: religious persecution, the Spanish Inquisition, attack upon their ancient rights and privileges, destruction of their commerce and prosperity through ruinous taxation and unrest, and the treachery and atrocities of Spanish troops and officials. Included in this dissertation as an example of the patriotic propaganda of the Netherlands, is a version of the Act of Abjuration of Philip II by the States-General, collated with the original minutes and other editions, and with an English translation.

Faced with a choice between what they regarded as the civil despotism of a foreign monarch and cooperation with their religious rivals, most of the Catholics of the Lowlands did little or nothing. They did not prevent or hinder the Calvinist efforts against Spain. Indeed, the pamphlets demonstrate that they gave the Calvinists more aid than opposition. Thus the pathway to the control of the revolted Netherlands was left open and uncontested to the Reformed by their Catholic compatriots. The Calvinists seized the initiative against Spain, gained the military direction of the revolt, and used this control to consolidate their domination of the independent country which finally emerged from the conflict. The pamphlets presented the arguments by which those of the Reformed religion and their patriotic allies convinced the people of the Netherlands — excepting the Walloons — that present civil oppression was worse than possible future religious difficulties, and they gained the passive and even active assistance of the Catholics against the foreign enemy.

Study of the Dutch pamphlets demonstrates the importance of the stubborn religious intolerance of Philip in the history of the Netherlands. If the King had been willing to bargain with the Protestants, the rebellion might have been averted or crushed and the eventual split of the Lowlands averted.

312 pages. \$3.90. MicA 55-2142

## HOME ECONOMICS

### A COMPARISON OF THE ATTITUDES TOWARD MATE SELECTION HELD BY A SELECTED SAMPLE OF PAKISTANI AND AMERICAN UNDERGRADUATES

(Publication No. 12,393)

Aquila B. Berlas, Ph.D.  
The Florida State University, 1955

Research studies on mate selection have shown that culture influences decisions in the choice of a marriage partner. The objective of this study was threefold: (1) to compare the attitudes of undergraduates toward mate selection in the Pakistani and the American cultures, (2) to discover differences in the attitudes toward mate selection between members of the same sex in the two cultures, and (3) to inquire into the differences in the attitudes within each culture when subjects are classified by sex, by occupation of the father, and by educational level of the father.

Subjects for the study consisted of a selected group of 500 American and 240 Pakistani single men and women undergraduates. The sample was drawn from four state-supported co-educational colleges located in four different regions of the United States and four colleges located in different parts of East and West Pakistan. Students included in the study were from all four years of college and were selected from those attending classes in required courses.

Data were collected through a pre-tested and revised questionnaire. Factors assumed to be important in determining attitudes toward mate selection in the two cultures and within cultures formed the dependent variables. The responses to the fixed alternative items were edited, coded, and tabulated by culture, by sex, and by occupational and educational classifications.

Significant differences between culture groups, between Pakistani and American men, between Pakistani and American women, between men and women of the same culture, and between cultural groups by the father's occupation and by the extent of the father's education were determined by the use of Chi-square.

Open end questions were categorized for analysis, the percentages of responses exceeding five percent calculated for items in each category, and findings discussed.

Significant differences between the two cultures were found on a large majority of the factors included in the questionnaire.

Pakistani students showed greater influence of parental control, traditions, and conventions, as well as inclination to favor traits and qualities in a mate that go with the concept of ideal love. Attitudes in transition were manifest by disagreement with the present practices of mate selection in their country and community.

The American students were inclined to favor greater freedom in mate selection. They desired equality and companionship in marriage.

Greater differences were found between the attitudes of American men and women than between Pakistani men and

women. This confirmed the findings of several previous studies in the American culture with regard to sex differences.

Statistical analyses also indicated a significant relationship between fathers' occupations and only one (importance of education) of the two factors tested. No significant relationship with either factor and the father's occupation (importance of education and social status preferred in a mate) was found for American students.

Significant differences were found for American students between the extent of the father's education and two of the three mate selection factors tested, but for the Pakistani students on only one of these three factors. The attitudes toward aims of marriage and conception of love expressed by American students through their responses to open end questions were consistent with empirical studies as well as with the American culture. Differences in their own and their parents' aims for marriage showed the younger generation's greater interest in more satisfying inter-personal relations, a desire for equality of marriage partners, and liberalized attitudes.

Pakistani students' attitudes were, in the main, in conformity with the ideal type of Pakistani young men and women as portrayed in the review of Pakistani culture. The influence of transition was manifest in their responses to the open end questions. An appreciable number wished to choose their own mates, to marry for love, and to be freer of parental control and tradition in mate selection and marriage. 206 pages. \$2.58. MicA 55-2143

### CONCEPTIONS OF MOTHER ROLES BY FIVE AND SIX YEAR OLD CHILDREN OF WORKING AND NON-WORKING MOTHERS

(Publication No. 12,394)

Elise Barrett Duvall, Ph.D.  
The Florida State University, 1955

The purpose of this study was to determine (1) whether there are significant differences between the ways in which children of working mothers and children of mothers not gainfully employed perceive the mother role, and (2) whether differences in the responses regarding the mother role are evoked by photographs and by simple line drawings of the same situations.

Although studies of parental roles and role concepts have been undertaken, most of what has been done has centered attention upon parents' concepts of their own roles or upon the older child's or the adolescent's conception of his parents' roles, but none have dealt directly with the effect of the mother's working outside the home on the child's conception of the mother role.



Two matched groups each consisting of 30 kindergarten and first grade children, served as subjects for this study. Half of these children were from homes where the mother was gainfully employed and the other half from homes in which the mothers were full time homemakers. The two groups were matched as to (1) sex, (2) age, (3) presence or absence of other children in the family, (4) occupation of father, (5) religion, and (6) sibling position.

The sixty families in this study represented a fair occupational cross section of the community of Tallahassee. Occupations of fathers ranged from unskilled labor to the professions, and occupations of the mothers ranged from saleswomen to teachers.

The data were obtained through pictorial interviews which were recorded verbatim on a high fidelity tape recorder. Responses were evoked by (1) photographs of mothers in thirteen roles commonly performed, and (2) outline drawings of mothers performing the same thirteen roles. These roles were: mother assisting child at bath time, bedtime, and mealtime; mother as religious teacher, companion, source of affection, disciplinarian, teacher, as person caring for child during illness, as economic provider, as protector, as housekeeper or cook, and as contributor to the species. The subjects were requested to "Tell me a story about this picture." Subsequently they were asked, "Who usually helps you ---?" and "Whom do you like best to have help you ---?", the investigator naming the situation shown in the picture or drawing to which the child had just responded.

Chi square was used to determine whether or not significant differences existed between the conceptions of the mother role held by children of working and non-working mothers and between the two instruments used to elicit children's responses.

Statistically significant differences were found between working and non-working mothers in (1) identifying the mother in the role of preparing food and caring for the child during illness; (2) selecting the mother as the person who usually carried these same roles, (more children in the non-working than in the working group both identified and selected the mother in these roles); and (3) preference for the mother working with many more children of working than of non-working mothers expressing this preference. Statistically significant differences between the two instruments, photographs and drawings, were found in three areas: food preparation, discipline, and religious training. In two of these, more children identified the mother from photographs than from drawings.

This study suggests the need for continued research in the area; for examining the concepts of a larger sample selected at random to discover possible differences related to social class; and for re-examining the concepts of mother roles held by this same group of children at different stages of development so that possible changes in concepts related to growth and development would be revealed.

The pictorial interview appears to be an easy and efficient method for ascertaining the younger child's attitudes and feelings toward his environment and the people with whom he is associated. 68 pages. \$1.00. MicA 55-2144

## THE THERMAL INSULATION AND ASSOCIATED PROPERTIES OF SINGLE AND MULTIPLE LAYERS OF FABRICS

(Publication No. 13,364)

Mary Ann Morris, Ph.D.  
University of Minnesota, 1954

Adviser: Ethel L. Phelps

The thermal insulation, air permeability, thickness, and other properties which are associated with the prevention of heat losses have been studied in order to determine what relationships exist within and between single and multiple layers of fabrics when serving as insulation against such losses. Various coatings, linings, inter-linings, and combinations of these fabrics, commonly found in ready-to-wear winter outer garments, have been used in this study. The thermal insulating capacity of the materials was measured in still air on a modified Fitch heat transfer apparatus under a pressure of 0.02 pounds per square inch.

The coating fabrics included woolens and worsteds and, of these materials, the woolen fabrics gave higher values for thermal insulation and certain other associated properties than did the worsted coatings. Therefore, the former type of fabric would give better protection against heat losses in still air than the latter. However, due to their higher permeability to air, woolen coatings might not be superior to the worsteds as insulators when used in a wind. Among the various linings and interlinings used, the quilted lining fabrics were found to have high thermal insulating values and low permeability to air.

Certain multiple layers of fabrics including a woolen coating combined with a quilted lining, were found to be superior to the other fabric combinations studied with respect to the prevention of heat losses in still air. A major factor to be noted was the greater permeability to air of such combinations. However, these combinations of fabrics did have relatively high values for this property and doubtless would be satisfactory under average winter wind conditions. Combinations of coatings with metalized satin lining fabrics, as measured in this investigation, were found to be inferior, in insulating ability, to the same coatings combined with an interlining fabric and a plain satin lining.

Accurate estimates of the insulation of multiple layers of fabrics were obtained by adding values for the individual fabrics involved only if the materials had smooth surfaces. If the individual fabrics have rough or irregular surfaces, the fabric combination should be measured directly. These differences observed could be explained in part by concomitant changes in thickness. The fact that considerably greater changes were observed for thermal insulation than for thickness indicates that enough air may be held between the layers of fabric to cause a significant increase in thermal insulation without, at the same time, causing a measurable change in thickness.

A close linear relationship existed between thermal insulation and thickness, and between thermal insulation and volume of air per unit area, for both single and multiple layers of fabrics. While thermal insulating values for single fabrics could be estimated most accurately from thickness measurements, the volume of air per unit area provided the best basis for estimating the thermal

insulation of multiple layers of fabrics. Thickness and volume of air both were very highly correlated with thermal insulation, indicating that a large proportion of the differences in thermal insulating capacity could be accounted for by these properties.

The linear regression lines, or freehand regression curves, representing the relationships between thermal

insulation and other properties, for single fabrics gave lower estimated values than did those for multiple layers of fabrics. Therefore, accurate estimates of thermal insulation for multiple layers of fabrics may be made only from equations based on measurements of such combinations. 208 pages. \$2.60. MicA 55-2145

## JOURNALISM

### A SURVEY OF THE ADVERTISING ACCEPTANCE POLICIES AND PRACTICES OF A REPRESENTATIVE GROUP OF DAILY NEWSPAPERS OF GENERAL CIRCULATION IN THE UNITED STATES

(Publication No. 12,898)

Leonard Joseph Hippchen, Ph.D.  
State University of Iowa, 1955

Chairman: Professor Ellis Newsome

#### THE PURPOSE OF THIS STUDY

The primary objective of this study was to gather information relating to the advertising acceptance policies and practices of a representative group of daily newspapers of general circulation in the United States.

It was anticipated that this information would help to determine newspaper managements' general attitudes toward a social responsibility to screen advertising, and to determine the relative efficiency of newspaper managements' attempts to restrict publication of fraudulent and objectionable advertising.

In addition, it was expected that the information gathered in this investigation would provide the basis for comparing subsequent advertising acceptance policies and practices of daily newspapers of general circulation in the United States.

#### THE PLAN OF THIS STUDY

In the primary investigation, a proportionate stratified random sample survey was made. Newspapers were stratified by four circulation groups (under 15,000; 15,000 to 49,999; 50,000 to 99,999; and 100,000 and over), and following a pre-test, a proportionate random selection of the elements was made from each of the strata. The total sample was 500.

Response to a mail questionnaire was 294, or 58.8 per cent. However, newspapers with larger circulations tended

to have a greater percentage of response: the largest circulation group had a 94.7 per cent response.

#### THE MAJOR CONCLUSIONS OF THIS STUDY

Because of disproportionate returns, particularly in the "under 15,000" circulation group, it is not certain whether or not these findings are representative of the total newspaper population. Hence, the conclusions are restricted to what appear to be the more obvious attitude and behavior patterns of the 294 daily newspapers that cooperated in the survey.

##### The First Conclusion

The survey shows that there exists a wide-spread awareness among newspapers of the problems engendered by fraudulent and objectionable advertising, but the managements of a majority of the daily newspapers indicate a reluctance to accept full "social responsibility" to screen advertising. It appears that the establishment of advertising acceptance policies on many of these newspapers has occurred in direct proportion to the intensity and frequency of adverse reader complaint.

##### The Second Conclusion

The survey indicates that managements fail to provide adequate organizations and controls to meet many of the problems of fraudulent and objectionable advertising. The result is only partial protection of the consumer, which can be expected to lead to adverse reader reaction.

##### The Third Conclusion

The objectives of existing newspaper advertising acceptance policies appear to be inadequately communicated to readers and advertisers by managements. Hence, newspapers may be open to criticism which is based largely on ignorance or misunderstanding.

279 pages. \$3.49. MicA 55-2146



## LANGUAGE AND LITERATURE

### LANGUAGE AND LITERATURE, GENERAL

#### THE "ELECTRA" THEME IN THE HISTORY OF DRAMA

(Publication No. 13,321)

Robert Willoughby Corrigan, Ph.D.  
University of Minnesota, 1955

Our basic inquiry in *The "Electra" Theme in the History of Drama* is to discover what happens to a mythological legend when it is used by different dramatists in various periods of history. We discussed such questions as why the dramatist uses mythological material, why each treatment of similar material differs, and why the modern versions of the Electra theme differ so radically from their classical Greek forerunners.

The thesis is divided into five chapters. (1) Myth and Reality in Greek Tragedy; (2) The Problem of Thematic Change; (3) Imagery as a Key to Tragic Tone; (4) Five Versions of the Electra Theme in Drama; and (5) Conclusion.

In Chapter One we reviewed the process by which myth became divorced from those ritualized ceremonies which were directly related to primitive man's concepts of reality. By virtue of this divorce, myth necessarily lost a direct contact with reality (in the sense of providing a rationale of the natural environment), but at the same time it gained new vitality as artists began to use mythological themes as a means of giving concrete expression to their personal analyses of the human situation.

In Chapter Two we described those forces which determined how the Electra theme changed in the history of the drama. The main point of this discussion was to describe the differences in value and form that exist between the theatre of ancient Greece and today. Three main differences were stressed: (1) The differences of theatrical convention which are manifested when drama is written for a presentational and ritualistically conceived theatre and when it is written for a representational and naturalistically conceived theatre. (2) The difference in scope which exists between the ancient theatre, where fact and ideal correspond, and the fragmented modern theatre where the ideal and actuality can never be reconciled. (3) The wide difference in attitude which exists between the ancient and modern world toward death and the tragic sense of life. We described how modern man, in his failure to accept death as a necessary part of living, can never achieve the affirmation which is present in classical tragedy.

Chapter Three is methodological in nature. Our discussion points out the limitations of Aristotle's treatment of poetic metaphor and describes a method of analysis based upon a study of thematic images.

Chapter Four is the most important one in the dissertation. By thoroughly analyzing Aeschylus' *Orestia*, the *Electra* of Sophocles, Euripides, and Hofmannsthal, and

O'Neill's *Mourning Becomes Electra* we were able to validate those theses proposed in the first three chapters.

We discovered that each version of Electra was used by the dramatist as a means of objectifying a particular situation. Aeschylus was concerned with analyzing the nature of justice. Therefore, he used the Atreus legend as a situation which could focus more sharply on the nature of justice. Sophocles is more concerned with the effects of choosing justice upon that individual who is compelled to make the choice. Euripides takes the same legend to show how impossible it is for man to choose justice rightly. Hofmannsthal was not concerned with justice. He saw in the Electra theme the story of a girl whose life was dedicated to the realization of revenge; a dedication which gave life and destroyed at the same time. O'Neill was attracted to the inheritance of guilt which is characterized by the House of Atreus.

Our conclusion discusses the great disparity that exists between the classical Greek and the modern dramatists in their attitudes toward value; and how such disparity has resulted in a narrowing and debilitation of tragedy.

393 pages. \$4.91. MicA 55-2147

#### THE NOVEL OF REALITY: AN ILLUSTRATIVE STUDY OF THE GENESIS, METHOD, AND INTENT OF OUR MUTUAL FRIEND

(Publication No. 13,057)

Monroe Engel, Ph.D.  
Princeton University, 1954

Contemporary criticism of the novel — and therefore, to some extent, contemporary appreciation of the novel — has a rather feeble grasp of the tradition of the active, behaviorist, topical, loosely formed, and essentially masculine English novel that more or less begins with Defoe and Fielding, and has Dickens for its great genius in the nineteenth century. We say today that Fielding, Smollett, Sterne, Dickens, Thackeray, are great writers; but we also say remarkably little more. We are no longer sure in what their greatness consists, or why or how we should read their books.

This study is conceived as a step in the recovery of these masters of fiction, by the loss of whom our reading pleasure, our contemporary fiction, and our understanding of our own lives has suffered. It is an examination of the method and intent of one novel in this tradition, Charles Dickens' last completed novel, *Our Mutual Friend*. It is intended to illuminate certain of the connections between the novel and the society it reflects. It exhausts neither the areas of study pertinent to this novel, nor even the total detail of the areas it approaches. It is intended only to show something significant of a way great fiction has and can be written.

Before coming to *Our Mutual Friend* itself, it seemed necessary further to clarify Dickens' major political and social views, and such theories of art in general and fiction in particular as he expressed or committed himself to. Chapter I, therefore, examines Dickens' views on representative government, class structure, the poor and the poor laws, money and industry; and proposes that it is more useful to think of Dickens as subversive than as radical. Chapter II examines his ideas on certain specific matters in the novelist's craft, and certain general matters of the aim and function of art, and the special problems of popular art. Chapter III considers what Dickens had to say about *Our Mutual Friend* while he was planning or working on it, and what the contemporary reviewers had to say when it was published. Chapter IV is an analysis of the novel with two special objects: the first and primary, to show how the social opinions revealed in Chapter I provide lines of organization for the book; and second, to show of how little consequence, contrary to common opinion, serial publication was to the structure of the book. Chapter V correlates the preceding material, and points to some conclusions and implications.

Certain deviations from normal practice in regard to evidence are important to the method and range of the study. Biographical and psychological evidence has been largely eschewed, which is both a strength and a limitation. Dickens' fiction has been largely disregarded as primary evidence for his political and social beliefs, because there is something close to tautology in deriving beliefs from one novel in order to clarify them in another, and because the beliefs as they demonstrate themselves in the novels have undergone the conditioning of Dickens' theory of fiction. For related reasons, Dickens' theory of art is derived from what he advocates rather than from what he does. More use than in any previous study of Dickens has been made of the weekly magazines he edited for the last twenty years of his life — *Household Words* and *All the Year Round*.

253 pages. \$3.16. Mic 55-278

#### SIR GAWAIN OF BRITAIN: A STUDY OF THE ROMANCE ELEMENTS IN THE BRITISH GAWAIN LITERATURE

(Publication No. 12,618)

Alan Mouns Markman, Ph.D.  
University of Michigan, 1955

The principal aim of the present study is to direct attention to the human qualities of Gawain, as opposed to his alleged divine quality, and to both the realistic and marvelous details in the background against which he has been displayed by native British writers. For over three hundred years Gawain was a popular hero in British literature. Three divisions of his extensive literary career have been made: The Primitive Gawain, The Early Literary Gawain, and the Late Literary Gawain. In chapters bearing those titles there will be found (1) a discussion of Gwalchmei and Gwri-Pryderi, early Welsh heroes who bear some relation to Gawain, (2) an analysis of Gawain as he is presented in four pseudo-histories, and (3) an analysis of Gawain as he is presented in seven native British metrical romances. The second and third chapters also contain an analysis of the social and intellectual background of the narratives.

Because so little is known about Gawain before Geoffrey of Monmouth, it was impossible to define accurately the primitive conception of him. Actually, before Geoffrey there is hardly anything in Welsh literature which suggests that either Gwri-Pryderi or Gwalchmei is a prototype of Sir Gawain. In the pseudo-histories and romances, however, Gawain is a complete literary figure. By placing all the information in various categories, such as Gawain's Fighting Skill, Gawain's Loyalty, Love, and The Marvelous, to name but a few, and by comparing that information, whenever possible, with contemporary non-literary documents, there has been established an accurate and complete description of the British Gawain.

These are the chief results of the study. In the 12th century pseudo-histories Gawain is a realistic representation of the feudal knight. Excepting Arthur, he has no peer as a fighter. His loyalty and courage are unmatched. He knows practically nothing of courtesy or chivalric behaviour. In the 14th-15th century romances Gawain is a representation of the ideal courtly knight. All his knightly qualities are exaggerated, but he nonetheless is presented as a probable human being. He is not a servant of love; Courtly Love is not represented in the British Gawain romances. Perhaps the most important finding is that Gawain is always presented as an actual man. He is not an average man, indeed, but not once are there ascribed to him supernatural or superhuman characteristics. Of unusual interest, too, is our estimate of The Marvelous — those actions, people, and descriptions which are clearly non-rational — only about ten per cent of the material is not realistic, or marvelous. The marvelous, however, is always functional in the romances, and its influence on the narratives is exceptional.

In many ways this study represents a new direction in Arthurian scholarship. The Gawain romances constitute a complex narrative cycle. Heretofore the hero, as he is presented in romance, has been neglected. By calling attention to Gawain's human qualities and the strange situations in which he has been placed, it is hoped that new interest in the British Gawain romances will be encouraged, so that they may be regarded as a humanistic literary creation which one may read not only for the excitement which their marvelous adventures offer, but also for the more rewarding experience of participating in the acts and deeds of a splendid human being.

368 pages. \$4.60. MicA 55-2148

#### CHARACTER AND TRAGEDY IN EIGHT FAMILY SAGAS

(Publication No. 13,198)

Julia Helen McGrew, Ph.D.  
Bryn Mawr College, 1954

The authors of the Icelandic family sagas inherited from the tenth century an Heroic belief that a man's character should be judged in terms of bravery, loyalty, and honor. The authors of these sagas learned from their experience in thirteenth century Iceland that a society could die when cowardice, betrayal, and dishonor governed the actions of individual members in that society. Forced, by the pressure of the events in their life-time, to analyze cause and effect, individual cause and social



effect, in the history of Iceland as well as in the histories of many Icelanders, the authors of the family sagas combined an interest in history with an interest in ethics in order to create fiction from history. They wrote their stories about the lives of individuals and families in tenth-century Iceland, but they wrote out of their own, later, century. Because the authors of the family sagas read history by the light of character, they used the dramatic method to so transform history into fiction. They dramatized both the Heroic standards of social conduct, and the history of Iceland's tragic collapse when the Commonwealth fell under Norwegian control. In the world of the sagas, a world of Heroism was created, not a world of heroes: the stories not only represent two different ages, but also present a dramatic commentary on the decline of the later age, when that society is contrasted, in terms of personalities, with the earlier, nobler, society.

Because the sagas are not dispassionate histories, because they are passionate, subjective, expressions by writers who knew the tragedy of any moral disintegration, we must go outside the sagas for some of the corroborative evidence of the truths they tell us about the Heroic century. The Icelandic laws indirectly reflect the concept of personality. They express no idea of legal personality, no philosophy of abstract Justice; but they give concrete empirical, statements of the individual's responsibilities and the law's penalties in acts of revenge and feud. The *Sturlunga saga* directly presents the history of Iceland in the thirteenth century, and gives us the facts of the tragic history of the Commonwealth, the truth of the tragic imagination of the authors of the family sagas.

These authors shaped and organized their selection of narrative in order to delineate character and characters. To the extent that their concept of personality was a formative influence in shaping their stories, the concept is a literary technique — characterization. But their interest in thus dramatizing events, and the interpretation of events, is also part of their concept of personality. I have used the term, concept of personality, to suggest also the Icelander's belief that great men make history; great Icelanders, the history of Iceland; and that an aristocratic, patriarchal society lives only as long as its members are great aristocrats.

Although the personalities and careers of some Icelanders magnetized oral, anecdotal, narrative, nevertheless the sagas as we have them are not scribal reductions of oral tales. They are conscious literary products. They are the work of creative writers. The primary sources for the proof of this statement are found in the choice of narrative material, the technique of characterization, and the strength of the tragic imagination, as we see these creating forces in the sagas. The Icelandic authors of the family sagas not only transformed fact into fiction; they also made fiction so real that it has been mistaken for documentary history. The same controlling idea, the concept of character, enabled them to raise epic to the height of tragic.

332 pages. \$4.15. MicA 55-2149

## THE ALLEGORY IN *HUDIBRAS*

(Publication No. 12,909)

Ward Searing Miller, Ph.D.  
State University of Iowa, 1955

Chairman: Professor Rhodes Dunlap

Whatever Butler's connection with Luke and Rosewell may have been, Butler's early relationship with John Selden may have been an influence of great importance, lasting perhaps twenty years. It offers a plausible source for much of Butler's knowledge of events in which Selden was a major participant, largely on the Parliamentary side, as an impartial constitutionalist. From about 1645, however, Butler's associations were mainly Royalist. The range of his friends and activities after 1660 indicates he was by no means a solitary or neglected figure. The idea that he saw the rebellion as Selden did and that he conceived *Hudibras* under this influence is credible. If he did, his politics shifted, from conviction or expediency, as public opinion did; and something had to be done to adapt for Royalist uses whatever he had already written.

As to the alleged allegory, which Butler does not clearly confess or deny, *Hudibras* gives much evidence of being a personification of the Presbyterian Long Parliament. Ralpho, then, must symbolize the Parliamentary armies, of which Parliament was indeed the "creator"; and one would expect each of the bear-garden figures in a similar way to portray a force of some kind connected with the rebellion. The first, Crowdero, must be on the King's side because he attacks both *Hudibras* and Ralpho so vigorously. His fiddle and his spirit seem to denote Cavalierism. This role as "prime offender" and "incendiary vile" is intelligible when one realizes how the high-handed behavior of James I, Buckingham, Laud, Charles I, and other Cavaliers served to inflame all classes and incite men like Selden to dispassionate opposition.

Orsin, the second figure in the bear garden procession, has traits and behavior that strongly suggest the role of the Scots in the rebellion, changing at length from the popular side to the King's. While Bruin gives hints of being a symbol of synods or episcopacy, the alignment of Bruin with Talgol, Magnano, Cerdon, and Trulla makes Bruin presumably Royalist. His actions seem to connote the prerogatives of kingship, which suffered defeat like Bruin but not extinction.

Talgol by his language and his slaughter of cattle is a military force, evidently Royalist. Magnano, who fights on the same side, has traits of inventor and wizard which strongly suggest Prince Rupert, but more as the culmination of the Royalist and aristocratic Dutch-German component of the King's military power than as a person.

Cerdon by his talent for preaching, his change from reformer to conservative, and his closeness to Bruin, appears to be the Presbyterian-Royalists. They became a potent factor for the kingship in the latter 1640's and the spearhead of reaction. Colon has associations that link him quite definitely with Cromwell, but he apparently portrays the larger force of rampant Independency. It in various ways abetted the King's forces in attaining power and by its use of power fostered Restoration. Trulla appears under analysis to be a burlesque goddess figure who personifies loyalty or providence bringing

Restoration, with allusions perhaps to Monk and the patriotism that prevented a new civil war.

The action of the bear-garden battle fits the major historical events in a nearly chronological manner that tends to vindicate the presence of allegory and to strengthen the interpretation of characters in this study. The order in which Butler presents the bear-garden figures is very close to the order in which the forces emerged that they seem to represent. The skimmington of Part II seems to allegorize the quixotic eagerness of the rebellion to condone tyrannical usurpation by church power, especially Presbyterian.

As an allegorist, Butler leaves much to be desired. In terms of such criteria as narrative interest, adequate characterization, effective symbolism, aesthetic factors, truth or fairness, and separation of levels *Hudibras* is clearly defective. It is the insufficiency of the symbolism which accounts in part for the kind of obscurity Butler did not condone but may have courted in order to make *Hudibras* as partizanny palatable as possible in a Restoration England quite different from the England in which it was conceived and no doubt largely written.

318 pages. \$3.98. MicA 55-2150

#### THE ETHICAL PATTERN IN THE PLAYS OF THOMAS MIDDLETON

(Publication No. 12,973)

William Longford Power, Ph.D.  
Vanderbilt University, 1955

Supervisor: Dr. Joseph Allen Bryant, Jr.

The object of this study is to decide whether there is an ethical pattern in the plays of Thomas Middleton (1580-1627) and, if there is such a pattern, to describe it. A number of scholars have found difficulty with Middleton's ethics. Some have believed that his plays are ethically neutral, others that they are immoral; others again have held that, while some of his plays are neutral or immoral, others of them are morally praiseworthy.

The canon of Middleton's plays is decided upon and, where necessary, responsibility is divided between Middleton and his collaborators. The principles to be followed in arriving at the ethical significance of a play are stated. The plays are then analyzed individually in chronological order. Finally, the ethical pattern of the *corpus* is considered.

The results indicate that Middleton took a profound interest in ethical questions. Apparent contradictions are the result of intellectual growth. In ethics and morals there are three main problems: is there a moral law? what is the moral law? and how may we know the moral law? Middleton's chief interest was in the first problem, though he also paid much attention to the second.

Is there a moral law? Middleton's plays begin with a youthful faith that the world is governed by a moral law. Soon they reflect a doubt that such a law exists until, about midway in his career, they present reasons for seeing the world as a moral chaos. After that, there seems to have been a steady growth of faith, until at the end of his career Middleton believed in the existence of a moral order more firmly than he had at the beginning.

What is the moral law? In general, Middleton follows Christian ethics, though he often points to the difficulty of applying them.

How may we know the moral law? In this problem Middleton shows comparatively little interest. It would appear that he followed the teachings of the Anglican Church.

The conclusion is that Middleton is a profound moralist whose plays try to ascertain man's moral position in the universe. 598 pages. \$6.58. Mic 55-279

#### THE TECHNIQUES OF CHARACTERIZATION AND DRAMATIC IMAGERY IN *RICHARD II* AND *KING LEAR*

(Publication No. 12,525)

George Foster Provost, Jr., Ph.D.  
Louisiana State University, 1955

Supervisor: Professor W. J. Olive

This dissertation studies parallels in the techniques of characterization and dramatic imagery in *Richard II* and *King Lear*. Shakespearean imagery criticism has revealed a number of ways in which the poet used imagery; but it has become increasingly clear that nothing helpful to an understanding of the dramas is to be gained from exhaustive categorization according to rhetorical schemes. This study, therefore, employs a flexible approach to the imagery, an approach based on the apparent dramatic purpose of each image.

The prevailing critical diagnosis of Shakespeare's *Richard II* is that he is a misplaced poet. This opinion has been so popular that understanding of the play has been obscured. It has been a similarly popular critical opinion that *Lear*'s madness is an imaginative reawakening by which the king attains insight. As a result of this theory, *Lear*'s unperceptiveness throughout his madness has not been generally recognized, and the close connection between his tragic mistake and his madness has been concealed.

Richard is actually portrayed not as a poet but as a person so committed to comfort of mind that he indulges every whim and appetite and, disastrously, blinds himself to everything uncomfortable. His determination to preserve his comfortable idea of himself as a perfect king prevents him from admitting the injustice he has committed in seizing Bolingbroke's property. Instead, Richard convinces himself that Bolingbroke is a usurper rather than a wronged subject, resigns the throne, and takes refuge in the self-pitying and erroneous thought that he has been the victim of unprovoked villainy. His profuse imagery, far from marking him a poet, is the register of his self-pitying, evasive mind. His tragic flaw is his blindness to uncomfortable truth; his tragic error, injustice.

Unlike Richard in some respects, *Lear* is very much like him in the area of the tragic flaw. *Lear*, too, is committed to comfort of mind and evades uncomfortable truth. Outraged at Cordelia's refusal to cater to his desire for flattery, he unjustly disinherits her and silences Kent's truthful objections. Until he goes mad *Lear* evades the obsessive thought that he has been unjust and that he is



not only directly responsible for the indignities he suffers, but in some measure deserving of them. On the heath he attempts to accept this humiliating truth, but is unable to, and takes refuge instead in an insane self-pity. His madness is characterized throughout by a refusal to face his guilt; his cure is simultaneous with his consenting at last to recognize and accept the truth. Lear's tragic flaw, like Richard's, is an evasive blindness to uncomfortable truth; like Richard's, Lear's tragic mistake is injustice.

The similarity of the tragic errors proves to be the central fact in a general similarity of the image structures of the two plays. The imagery of each play is appropriately and organically, constructed around the central dramatic idea of the king's injustice. Richard's blindness to truth is symbolized by the iterative image of blinding tears; Lear's blindness, by the sight-and-blindness theme. The other significant image themes in both plays symbolize various aspects of the kings' injustice; and the central idea of injustice is itself symbolized in the series of trial scenes which dominates each play.

The image techniques of the two plays are alike not only in the overall design of the image themes but in various minor ways as well. Contrary to previous critical opinion, the basic image functions of the mature tragedies are already worked out in *Richard II*; the improvements in *Lear* are largely due to economy and more expert dramatic placing. *Richard II* comprehensively anticipates the techniques of *King Lear*. 274 pages. \$3.43. Mic 55-280

## LANGUAGE, AND LITERATURE, LINGUISTICS

### DERIVATION IN CHEREMIS

(Publication No. 12,834)

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Indiana University, 1955

I. Introduction. Cheremis is a Finno-Ugric language spoken in Central Russia around the Volga by more than half a million people. The three major dialect groups of the Cheremis language are the Western, the Central Eastern and the Eastern. The Western and the Eastern dialects are quite wide apart, as far as phonemics or morphophonemics is concerned, but morphologically and lexically they differ only little.

2. Morpheme classes. The morphemes of the Cheremis language fall into three classes: bases, affixes and enclitics.

2.1. A base is a morpheme that can appear alone as a monomorphemic word or as the first morpheme in a polymorphemic word. Bases fall into two classes: bases that take affixes, operative bases, and bases that do not take affixes, non-operative bases.

2.2. A sequence of an operative base and one or more affixes that in its functions is equivalent to an operative base is a stem.

2.3. An affix is a morpheme that occurs only in connection with a base or a stem, as bound morpheme in a polymorphemic word. In Cheremis the affixes follow the base,

that is, they are suffixes. Suffixes fall into three classes: derivation suffixes, inflection suffixes and a few suffixes that function sometimes as derivation, sometimes as inflection suffixes.

2.3.1. Derivation suffix is a suffix that added to a base, stem or word forms a polymorphemic word that in its functions is equivalent to a monomorphemic word. The morphological class of a word is determined by the last derivation suffix included in it.

2.3.2. Inflection suffix is a suffix that added to a base, stem or word forms a polymorphemic word that in its functions is not equivalent to a monomorphemic word. In a word containing both derivation and inflection suffixes the relative order is that of derivation suffixes preceding the inflection suffixes.

2.4. Enclitic is a bound morpheme that may occur as the last morpheme in any word. Accordingly, contrary to the suffixes, an enclitic may occur added to a non-operative base.

3. Morphological categories in Cheremis. Bases examined in sequence with the suffixes they take give three morphological categories for Cheremis: nouns, verbs and particles. By means of suffixation nouns are defined as to case, verbs as to mode-tense; particles have no suffixation and are thus identical with non-operative bases.

3.2. Derivation suffixes fall into two classes: noun suffixes and verb suffixes. Noun suffixes make the base or stem to which they are attached into a noun; verb suffixes make the base or stem to which they are attached into a verb. Accordingly, a stem can be defined as a noun stem or as a verb stem, depending on the last derivation suffix included in it.

4. Syntactical categories.

4.1. Observed as to their occurrence in a sequence of words in an utterance, nouns can appear as substantives, adjectives or adverbs.

4.2. On syntactical criteria verbs can be divided into transitive verbs and intransitive verbs, according to their occurrence in regard to a noun in the object case in an utterance.

II. Derivation.

O. On an operative basis, derivation suffixes can be divided into unrestricted and restricted suffixes. Unrestricted suffixes can be added to both nouns and verbs, restricted suffixes can be added either to nouns or to verbs, but not to both. There are unrestricted and restricted suffixes both among noun and verb suffixes. Accordingly, the following possibilities may occur:

N

- Nn = N; N - Nn = N; V - Nn = N

V

N

- Vv = V; N - Vv = V; V - Vv = V

V

1. Noun suffixes.

1.1. Unrestricted suffixes. Altogether 12.

1.2. Restricted suffixes.

1.2.1. Added to nouns. Altogether 27.

1.2.2. Added to verbs. Altogether 11.

2. Verb suffixes.

2.1. Unrestricted suffixes. Altogether 11.

2.2. Restricted suffixes.

- 2.2.1. Added to nouns. Altogether 11.  
 2.2.2. Added to verbs. Altogether 6.  
 162 pages. \$2.03. MicA 55-2151

THE PHONOLOGICAL PROBLEMS  
 INVOLVED IN THE TEACHING OF  
 AMERICAN ENGLISH TO NATIVE  
 SPEAKERS OF LEBANESE ARABIC

(Publication No. 12,628)

Raja Tewfik Nasr, Ed.D.  
 University of Michigan, 1955

As yet no linguistic basis has been provided for the teaching of English to native speakers of Arabic. Modern structural linguistics has taught us that language is a system, a structure, not a conglomeration of fragmentary elements of sounds, lexical items, and grammatical rules.

This dissertation aims at arriving at the phonological problems involved in the teaching of American English to native speakers of Lebanese Arabic. For this purpose, the North-Central dialect of American English and the Ras-Beirut dialect of Lebanese Arabic are taken.

The Introduction deals with the importance of the subject as a tool in the preparation of teaching materials for students.

Chapter One is a phonemic analysis of Lebanese Arabic. For this purpose, a corpus of data is recorded and transcribed phonetically. The following phonemes and their allophones are found — /b/ [b], /m/ [m], /f/ [f], /t/ [t] [th], /d/ [d], /n/ [n] [ŋ], /l/ [l], /ʔ/ [ʔ], /r/ [r], /R/ [R], /s/ [s], /z/ [z], /Z/ [Z], /D/ [D], /T/ [T], [Th], /S/ [S], /š/ [š], /ž/ [ž], /k/ [k] [kh], /x/ [x], /g/ [g], /h/ [h], /H/ [H], /9/ [9], /ʔ/ [ʔ], /w/ [w], /y/ [y], /ii/ [ii] [i], /i/ [i] [ɪ] [e] [ē], /ee/ [ee] [ē], /aa/ [aa] [æ], /a/ [a] [æ], /uu/ [uu], /u/ [u] [o].

Gemination is also significant in Lebanese Arabic. Initial and final consonant clusters are also presented.

In dealing with the same corpus of data, Chapter Two arrives at the supra-segmental phonemes of Lebanese Arabic — stress, juncture, pause, rhythm, and intonation. The results — Stress — [ˈ], [ˌ], [ˑ] (all of them predictable) plus a moveable sentence stress.

Juncture — plus juncture / / (space), minimal juncture /-/.

Pause — short pause /, long pause //.

Rhythm — syllable-timed.

Intonation — /1/, /2/, /3/, /4/.

Chapters Three and Four present the segmental phonemes of American English and their allophones, and the supra-segmental phonemes according to the analyses of scholars in the field. Different analyses pertaining to the phonological aspects of American English are also presented. I am not responsible for these analyses except insofar as I compare them, comment on them, and make choices for pedagogical purposes.

Chapter Five aims at a comparative analysis of Lebanese Arabic and American English in order to spot the phonological problems involved in the teaching of American English to native speakers of Lebanese Arabic. These problems pertain either to point of articulation, phonemicization, or to distribution. The problems are — /t/, /d/,

/1/ [1] [ɪ], /r/, /g/ [g], /h/ [h], /ə/ [ə], /δ/ [δ], /v/ [v], /p/ [p] [ph], /i/, /ɪ/, /e/, /ε/, /æ/, /a/, /ə/ [ə] [ǝ] [ə], /u/, /v/, /o/, /ɔ/, /ɔɪ/.

Juncture — change from two internal junctures to one.

Length — change in the distribution.

Rhythm — change from syllable-timing to stress-timing.

Stress — change from predictable to non-predictable pattern.

In Chapter Six, the English speech of native Lebanese Arabs is transcribed phonetically to verify the findings arrived at in the preceding chapters. All the problems stated in Chapter Five appear in the speeches transcribed; no other problems are spotted.

The aim of any linguistic analysis is to make people use a language. The analyses and the summaries in the dissertation are not ends in themselves. The end is to make Lebanese students proficient hearers and speakers of American English. The conclusions arrived at are to be used in the preparation of lessons whereby the important phonological habits may be formed.

A language is not restricted to its phonology. There are other important aspects to a language — namely, its lexicon and grammar. So the dissertation provides one part of the linguistic basis for teaching materials. This must be supplemented by similar studies in lexicon and grammar if a complete job is to be done of teaching American English to native speakers of Lebanese Arabic.

171 pages. \$2.14. MicA 55-2152

THE DIALECT OF NORTHWESTERN OHIO:  
 A STUDY OF A TRANSITION AREA

(Publication No. 12,635)

Edward Earle Potter, Ph.D.  
 University of Michigan, 1955

This study of speech patterns in six counties of Northwestern Ohio is based on responses given to a mail questionnaire by sixty informants. The questionnaire dealt only with vocabulary items and asked the informant to choose the terms which he regularly used for approximately one hundred folk concepts. The vocabulary items thus collected were studied to determine these four things: (1) the geographical distribution of the terms in the six counties, (2) the Origin of the terms in the light of their dissemination in the East, (3) the social distribution of the terms according to age, occupation, and education; and (4) any dialect trends.

A chapter is devoted to each of the following: (1) an account of the settlement and growth of Northwestern Ohio, (2) a full description of the linguistic materials and informants used by the study, (3) an analysis of the vocabulary items according to their geographical distribution and to their origins in the Eastern United States, (4) an analysis of each of the terms in the light of its dissemination in various age, occupation, and education groups; and (5) a statement of the conclusions which appear to be warranted by the analysis. Two appendices are also included. Appendix I has a map for each of the one hundred concepts to show at a glance in which counties the various terms appear. In Appendix II each of the concepts is shown in its distribution, by county, through each of the six social groupings.



The result of the analysis was that five general conclusions could be drawn. First, the area appears to be moving toward more general use of Midland rather than Northern terms. This is suggested by the fact that the percentage of Northern terms declines from the high point of 30% for old people to only 17% for both the middle-aged and the young; and it is further evidenced by the fact that the Northern terms are commonest among the least educated people. Both youth and education favor the Midland dialect.

Second, the data confirm the observation made by many linguists that the least educated people tend to be more conservative than the better educated people. Educated people appear to be more ready to accept terms outside of their own dialects.

Third, it was found that occupation is considerably less important than age or education in shaping the common, everyday vocabulary.

Fourth, the kind of item which is subject to the most confused usage is one having some connection with edibles. All instances of mixed Northern and Midland usage were in this category except one.

Fifth, and finally, the study offers further evidence of the reliability of the mail questionnaire as a means of collecting information about matters of vocabulary, because it confirms previous findings that the major isogloss between Northern and Midland areas cuts through the waist of the six counties in the northwestern corner of Ohio. 388 pages. \$4.85. MicA 55-2153

#### LANGUAGE AND LITERATURE, MODERN

##### DARWIN AND THE LITERARY CRITICS

(Publication No. 13,065)

Phillip Dean Appleman, Ph.D.  
Northwestern University, 1955

The publication of the *Origin of Species* in 1859 was the occasion for some of the bitterest controversy in the nineteenth century. The ancient idea of evolution immediately took on vigorous new life and its influence was soon to be seen in every field of thought, including that of literary criticism. Not all critics, however, reacted in the same way to the revolutionary scientific concept. This study analyzes three critics' responses to Darwinism.

The first chapter is largely descriptive, pointing out some relevant details of the general background of the period: the state of Victorian criticism in general, the place of science and evolution in the nineteenth century and the general critical response to each, and brief summaries of specific critics' adaptations of evolution in America, Germany, and France.

The body of the dissertation is chiefly analytical, giving detailed examinations of the effect of evolution on three Victorian critics, John Addington Symonds, Walter Pater, and Sir Leslie Stephen. Symonds turned directly to evolution for specific devices: a working analogy, a critical

vocabulary, and a method of organizing his materials. Pater, on the other hand, substantially because he was so impressed by the relativism of an evolutionary world, turned to his own personal reactions and to a historical approach as means to a critical position. Finally, Leslie Stephen accepted Darwinism wholeheartedly and, taking the hint from Walter Bagehot, adapted Darwin's process of natural selection to literature.

As the first chapter describes the conditions behind the rise of evolutionary criticism, so the last chapter points out some of the new conditions which caused its decline. Growing discontent with scientific and evolutionary criticism, the rise of impressionistic and psychological criticism, and an energetic demand for textual analysis were among these conditions. The function of evolution in contemporary criticism is briefly described. In general, however, the dissertation does not try to give a comprehensive survey of all attempts to ally evolution with literary criticism, but to analyze closely the specific ways in which Darwin's confirmation of the remarkably fertile idea affected the language, general methods, and specific techniques of three prominent late-Victorian critics. 247 pages. \$3.09. MicA 55-2154

#### ANGLO-SAXONISM IN AMERICA, 1880-1898

(Publication No. 12,883)

Roscoe L. Buckland, Ph.D.  
State University of Iowa, 1955

Chairman: Professor Charles T. Miller

This study examines the belief in the superiority of a person called the "Anglo-Saxon" and his institutions as that belief was expressed between 1880 and the outbreak of the Spanish-American War. Writings and speeches of public figures, work of scholars, and literature of the period were studied to discover the pattern of thought, and to determine the relation between Anglo-Saxonism and some problems of the period.

The Anglo-Saxon was believed to be a Teuton. Defining the modern Anglo-Saxon was complicated by the problem of defining race, so that those who believed in the existence of the Anglo-Saxon generally defined him in terms of character. He was held to be a man of somewhat inferior intellect but of superior spirit. His spiritual characteristics were great virtue (moral courage), the "westward" instinct, the wealth-creating instinct, and deep reverence.

Religious, political and economic institutions of America were held to be of Anglo-Saxon origin. The Anglo-Saxon had developed Protestantism and in America had separated Church and State, yet retained a Christian nation. The national government, and local political institutions of the United States were Anglo-Saxon institutions. Modern industrial capitalism and free-hold agriculture had been developed by the Anglo-Saxon and brought to its highest form in the United States. The "essentials" of the religious, political and economic institutions were Anglo-Saxon and any changes in the form of the institutions must accord with Anglo-Saxon principles.

The United States was held to be the new center of the Anglo-Saxon world. Resources, climate and people were combined to make a greater Anglo-Saxon nation. Two domestic perils faced the Anglo-Saxon in the new world: ethnic disintegration and spiritual degeneracy. Ethnic disintegration might result from unrestricted immigration or the undisciplined activities of the Indian and the Negro. Three sources of spiritual degeneracy were most often cited: Catholicism, Mormonism and Mammonism. Catholicism and Mormonism came to be regarded as lesser problems by 1898. The usual Christian argument against materialism was made, and the idea advanced that the "money-power" was destroying the spirit of the race.

It was felt that the Anglo-Saxon of the New World must expand his economy and/or his political boundaries to persevere. A conflict with Europe and Asia was felt to be impending. There developed a new idea of the mission of America; the mission to protect "the race" and to carry its civilization to the world.

There were divergent tendencies in thought. Some felt that Anglo-Saxon expansion must come through the development of commerce and the example the Anglo-Saxon set; others felt that the United States must take control of foreign lands forcibly. There were deviations in theories of racial origins and national contributions to the race's development. There was a tendency to emphasize either environmental or biological explanations of race qualities. Materialistic Anglo-Saxonism stressed the material contributions to world progress and the necessity of maintaining material progress. Spiritual Anglo-Saxonism feared the effect of materialism, and demanded that the Anglo-Saxon keep his spirit strong by ritual, strenuous living or military activity.

231 pages. \$2.89. MicA 55-2155

#### HERMAN MELVILLE AND THE SEARCH FOR COMMUNITY

(Publication No. 12,895)

John J. Gross, Ph.D.  
State University of Iowa, 1955

Chairman: Professor John C. Gerber

This study undertakes a reinterpretation of the work of Herman Melville through viewing that work as a continuous attempt to achieve reconciliation between the values of individuality and community. It is the main contention of the study that Melville, particularly in the novels beginning with *Mardi* and ending with *Pierre*, explores the practical and philosophical consequences of embracing the position represented by absolute idealism and discovers that it results in the annihilation of the self as well as the sacrifice of the community principle by which the individual may achieve a vital relationship with his fellows.

The concept of Community, which is seen here as a longstanding and continuing need of the American writer, is defined in humanistic and in theistic terms. A kind of humanism is suggested in the attempt to define the national community which Melville apparently hoped to realize through "heart" or the good will of men working together in the American nation, with a certain measure of

necessary social amelioration, for the creation of a new brotherhood of man. Best seen in the work of the late 1840's, and particularly in *Redburn* and *White-Jacket*, the hopes for the humanistic community falter before the violation of community by the intense individuality of the age, represented by an Ahab, and the denial of absolute idealism by a society largely motivated by self-interest and an expedient relativistic standard of values, as in the tragedy of *Pierre*.

The theistic community toward which Melville aspires following the disillusionment expressed in the writings of the 1850's strives to achieve a reconciliation between absolute, heavenly standards and relativistic, earthly standards. It is one of the contentions of this study that the major concern of Melville from the Civil War poems through *Billy Budd* is found in his need to reconcile these seemingly irreconcilable standards of value. An increasingly materialistic society which placed a blind trust in the new science and accepted the decline of a traditional faith in God and in the divine element in man confronted Melville with the imperative challenge which led to his attempted creation of a new synthesis.

A continuous effort has been made in this study to give a social and cultural emphasis to Melville's work in an attempt to correct a too exclusive view of Melville as an isolated individual engaged solely in an attempted resolution of personal spiritual problems. The present writer has felt that balance might be restored by presenting Melville as a representative thinker and artist of his time, concerned no doubt with the resolution of personal questions but above all else devoted to the meaning of democracy as it developed in America and as it raised new problems of the relationship of the one to the many, of the individual to the community. These concerns are perhaps necessarily related to the problem of the writer in America who, without an established vital artistic tradition or a firm and stable social order against which his experience might be projected (Melville appears to have regarded himself as a fallen patrician whose status was most uncertain), was forced to create a series of societies from which his meanings might emerge.

Attention is therefore given to the need of the American writer for self-definition, and to the concern of Melville with status, with class relationships, and the meaning of community in a society based upon the unrealized assumptions of equality. Throughout, an effort has been made to see Melville against the background of his time and in relation to the thought of his more alert contemporaries. Finally, to overcome the tendency by which Melville is often viewed as an insular national figure, comparisons have been made between the development of his thought with that of certain of his European contemporaries, most notably the Russian novelist Fyodor Dostoevski.

330 pages. \$4.13. MicA 55-2156



# THE RELIGIOUS AND AESTHETIC IDEAS OF MATTHEW ARNOLD

(Publication No. 12,616)

William Anthony Madden, Ph.D.  
University of Michigan, 1955

The present study originated in an assumption, suggested by Arnold's explicit association of poetry with religion, that a clearer understanding of Arnold's religious views would lead to a better understanding of his aesthetic views and their place in English literary history. There has been disagreement over the purport and merit of Arnold's religious criticism ever since its appearance in the 1870's. During his lifetime Arnold had come to be regarded as a theologian as well as a literary figure, but after his death in 1888 his religious ideas suffered an eclipse which endured until T. S. Eliot reintroduced them when discussing Arnold's relevance to the central problem of modern literary criticism, the problem of poetry and belief. Recent scholarly studies have touched on Arnold's religious position, but no attempt has yet been made to trace systematically the relation between this position and Arnold's aesthetic outlook.

This study was undertaken, therefore, with the dual purpose of elucidating Arnold's religious history and of relating this history to his literary career. Chapter I treats the background and development of Arnold's thought up to 1870, when his direct investigation of the religious question began. Chapter II explores in detail the religious view Arnold espoused in his criticism during the 'seventies and its origins in his earlier thought. Chapter III discusses Arnold's aesthetic ideas, pointing up the relation between the development of these ideas and his religious experience. Chapter IV summarizes the findings of the previous chapters and discusses briefly the relation of Arnold's views to subsequent developments in English literary criticism.

Two conclusions emerge from this analysis: (1) that Arnold's aesthetic ideas underwent important changes; (2) that these changes can be traced ultimately to his religious experience. The central fact of Arnold's life is his loss in youth of the Christian faith. His early years reveal an attempt to ignore this loss of faith by making poetry out of the doubts which it occasioned. His middle years, from 1850 to 1870, include Arnold's unsuccessful attempt to rest in poetic creation, followed by his first approach to the religious issue in an expanding critical effort designed to provide a new spiritual basis for English literature. This criticism is a testing of Victorian life and manners by aesthetic criteria which are heavily colored by contemporary historical ideas. The final phase includes Arnold's ten years of direct religious criticism, based on essentially aesthetic criteria, and his subsequent return to literature with a viewpoint significantly altered by his earlier effort to find a substitute for the faith he had lost.

This study emphasizes that Arnold's thought served as a bridge between the early nineteenth-century romanticism of Coleridge, with its basically Christian frame of reference, and the later romanticism of Pater, Yeats, Richards, and Read, with its basically non-Christian frame of reference. Arnold's religious career is thus a gradual but consistent moving away from the remnants of a dogmatic, supernatural religion toward an increasingly explicit naturalistic morality, and his aesthetic career a corresponding

tendency away from a formalistic toward a moralistic emphasis, from a view of poetry as technique imposing form toward a view of it as lofty emotion constituting the essence of a new religion.

379 pages. \$4.74. MicA 55-2157

# THE CONTEMPORANEOUS REPUTATION OF JAMES RUSSELL LOWELL

(Publication No. 12,778)

Alvan R. McFadyen, Ph.D.  
The University of Florida, 1955

This study of James Russell Lowell's contemporaneous reputation which has no claim to completeness extends over a period of fifty years — 1841, the year his first book appeared, to 1891, the year of his death. It is based mainly on reviews and articles in both the American and English magazines, supplemented by newspaper articles and references to Lowell and his works found in the books, letters, and memoirs of his friends, acquaintances, and critics. The material is arranged chronologically by countries, the English articles usually being placed after the American ones for greater coherence. Biographical material when it has seemed relevant to a consideration of either a work or its reception has been included.

The purpose of this dissertation is to present Lowell as he appeared to his contemporaries as a poet, lecturer, teacher, editor, essayist, critic, and diplomat. The amount and variety of the material made selection a necessity, and in the selection of material, the less known has been given precedence over the more familiar. In doing this the writer trusts he has made available some new material concerning an important man who had a part in influencing the thinking, political and literary, of our country during a decisive era.

560 pages. \$7.00. MicA 55-2158

# THE EFFECTIVENESS OF RHETORICAL DEVICES IN ELIZABETHAN EPYLLIA

(Publication No. 12,622)

Paul William Miller, Ph.D.  
University of Michigan, 1955

The purpose of this study is to show, with specific reference to a carefully limited body of poetic material, the extent to which rhetorical analysis can be usefully applied to the critical evaluation of poetry that employs the devices of rhetoric relatively freely and conspicuously. An initial justification of such a study rises from the conviction that although the devices of rhetoric are used so freely and conspicuously in some poems as to demand that attention be paid their rhetorical, as distinguished from their more obviously poetic qualities, a thorough knowledge of the rhetorical conventions of poetry is now generally lacking. Secondly, the rhetorical qualities of such poetry have been so highly praised by critics in the

periods when it flourished (in the Elizabethan period, for example), that their claims ought not to be lightly brushed aside; instead, these claims should be seriously examined and tested in the light of a careful rhetorical analysis.

It appears advisable to limit such a study to a body of poetic material that is small enough to allow for detailed examination, but not so limited as to be devoid of general significance. In order to meet these requirements, this study analyzes the extent to which the effectiveness of poems of a period and genre which draw especially heavily on the devices of rhetoric is determined by their more or less effective use of rhetoric. The period chosen is the Elizabethan period, and genre the *epyllion*, and the poems selected for study as representative *epyllia* are Lodge's *Glaucus and Scylla* and Marlowe's *Hero and Leander*.

The relative effectiveness of rhetorical devices in Lodge's and Marlowe's poems is analyzed according to categories and definitions of rhetorical devices in Sister Miriam Joseph Rauh's excellent work, *Shakespeare's Use of the Arts of Language* (New York, 1947). Following the illustration of rhetorical devices used by Lodge and Marlowe from these categories, the effects achieved by these devices and their relative effectiveness in the poems are successively treated.

From this study one can conclude that the Elizabethan *epyllia* which these poems represent are highly rhetorical, even by comparison with classical and modern poetry of this type. Moreover, it appears that the superiority of Marlowe's to Lodge's poem to a considerable extent depends upon the greater clarity, appropriateness, freshness and subtlety of his use of rhetorical devices. Re-examining both poems in the light of this rhetorical analysis, one is freshly impressed with the superiority of Marlowe's poem in its conception as well as in the execution of its aims. For Marlowe's poem is not finally concerned with a conventional narrative about a youth and a maid, as Lodge's is, but with the glorious, even if ultimately futile response of its lovers to the Fate which foredooms the long enjoyment of their love. *Hero and Leander* is a skilfully executed idealization of man's struggle against time, change and Fate, and rhetorical analysis helps us understand its emphases and assess its merits in the terms of its own age.

173 pages. \$2.16. MicA 55-2159

#### THE WHITMAN CONTROVERSY IN FRANCE

(Publication No. 12,360)

Frances Etheridge Oakes, Ph.D.  
The Florida State University, 1955

The history of Whitman's reputation in France during the hundred years since the publication of *Leaves of Grass* is one of neglect and indifference in the early years growing gradually into sporadic flashes of interest toward the close of the nineteenth century. Early in the twentieth, literary cliques and important literary men began to find inspiration in Whitman's works, both prose and poetry, and so made him known to the reading public. In a short space of time, interest in his work reached such a height that *le whitmanism* became recognized as a literary trend.

Whitman's reputation had scarcely been established, however, when he was attacked on moral grounds and a

violent controversy flared up concerning his moral character. The dispute began with a description of Whitman's funeral written by Guillaume Apollinaire, a well-known poet, critic, and journalist, for his regular "gossip column" in the *Mercure de France*. The account, reputed to be that of an eyewitness of Whitman's funeral, is an absurd mixture of fact and fancy that represents the funeral as a drunken orgy and Whitman himself as a libertine, homosexual, and drunkard.

Published on April 1, 1913, the account aroused the ire of Whitmanites in France and America. Stuart Merrill, an American ex-patriate and Symbolist poet, defended Whitman in a letter to the editor of the *Mercure* and offered proof that the account was inaccurate. He deplored the story for its vilifying of a noble man whom he had met while resident in America. He was joined in this defense a little later by Benjamin de Casseres, a New York journalist and author, who had been on the staff of the *Philadelphia Press* at the time of Whitman's death and who therefore had first-hand information concerning the rites.

Harrison Reeves defended Apollinaire's account as did Edouard Bertz, a German critic, who attacked Whitman on grounds of his reputed homosexuality. Bertz also attacked Leon Bazalgette, Whitman's French biographer, who refused to be drawn into a discussion of absurdities. Albert Schinz and Harrison S. Morris, one of Whitman's intimate friends, jointly wrote an enlightening letter, but it was somewhat anti-climactic as Apollinaire had already retracted his original story.

The *Whitman Controversy in France* presents the documents of the dispute, identifies the controversialists wherever possible, and analyzes the account of the funeral and the other documents to determine the extent to which facts have been exaggerated or falsified.

The continued increase of Whitman's reputation in France has shown that the controversy did little, or no, damage to the poet. This kind of controversy, however, serves to indicate the necessity for American scholars to analyze American authors' reception in foreign countries and to provide the foreign reader and critic with biographical and critical works. An adequate supply of information about Whitman together with information about American life and customs would have precluded the development of the controversy because the ignorance, animosity, or irresponsibility of the anti-whitmanites would have been immediately confronted by the truth.

205 pages. \$2.56. Mic 55-281

#### A STUDY OF THE RHYMES OF THE METAPHYSICAL POETS WITH PARTICULAR REFERENCE TO RICHARD CRASHAW

(Publication No. 12,782)

Mary Ellen Rickey, Ph.D.  
The Florida State University, 1955

Many aspects of the rhymecraft of the so-called Metaphysical poets have heretofore been dismissed as merely odd or awkward. A close examination of these practices both convinces one that they are deliberate and gives him considerable insight into the meaning and structure of



Metaphysical verse. It is perhaps surprising that the most intricate rhyme patterning of the day appears in the verse of Richard Crashaw, surprising because of the skill with which he disguises the logical precision of his rhyme arrangements in an effort to suppress the intellectual factor in his devotional pieces. In his early, conventional work, one finds certain traces of his later technique — the abundance of rhyme repetitions, as well as the association of a distinctive rhyme with one section of a poem. During the last decade of his life, Crashaw moved away from the use of the same stanza form throughout a piece of verse using either paragraphs of varying rhyme schemes or couplets of varying line lengths. In these irregular poems, Crashaw repeats single rhymes and whole rhyme patterns, skillfully manipulating line lengths and rhythms to accentuate or blur the sharpness of the likenesses.

Many of Crashaw's poems exist in two or three revised forms. The changes that he made in the rhyme designs offer clear evidence that his later structures, though more elaborate than his early ones, are no less balanced and no less effective as a means of emphasizing the logical outlines of his verse.

Other poets make their rhymes perform different services. Donne frequently arranges repetitions of personal pronouns in rhyme positions to bracket the sections of his poems. Herbert uses similar repetitions in most of his later poems. His conspicuous rhyme patterns, the delight of many twentieth-century readers, appear also to have appealed to his disciple Vaughan. Many of Vaughan's rhyme schemes are direct borrowings from *The Temple*. Thomas Traherne, frequently censured for the roughness of his verse, actually uses rhyme repetition and variation within the confines of a single poem with real artistry.

A study of the rhymes of these poets shows that their famous ability in the realm of imagery is matched by their skill in handling rhymes.

390 pages. \$4.88. Mic 55-282

# THE NARRATIVE TECHNIQUE OF ELIZABETHAN VOYAGE AND TRAVEL LITERATURE FROM 1550 TO 1603

(Publication No. 13,051)

William Beckler White, Ph.D.  
Lehigh University, 1955

This study attempts to throw more light on the significance of Elizabethan voyage accounts as literature by a consideration of the narrative techniques employed in this type of writing and by a consideration of its affinity to Elizabethan history, biography, and prose fiction.

As a result of a detailed study of one hundred and seventy-six narratives by Englishmen of voyages and travels outside the British Isles between 1550 and 1603, the following characteristics were noted:

1. The authors were mostly merchants, mariners, and gentlemen adventurers, who had received no more than a grammar school education and who wrote little besides the accounts of their voyages.
2. The most commonly used forms were the journal and ordinary narrative.
3. Most of the narratives were written for the practical purpose of providing a record of a voyage.

4. Most of them are first-hand renditions of the authors' personal experiences.

5. Most of them appear to have been written soon after a voyage from private notes or from the ship's log.

6. The point of view expressed is determined most often by the author's occupation and his position on the voyage.

7. The nature of the events narrated ranges from the heroic to the commonplace.

8. Most of the narratives begin and end abruptly with the statement of the departure and arrival of ships.

9. The outward voyage receives a fuller treatment than the homeward one.

10. Informative geographical descriptions make up a large portion of many accounts.

11. Aside from self-revelations by the authors, the leaders are usually the only persons characterized.

12. Characterization is accomplished directly through words of praise and indirectly through conversations and action.

13. A strong current of realism runs throughout these narratives arising from the use of carefully selected concrete details.

14. Most authors are objective and matter-of-fact in their narration. When personal attitudes are voiced, they usually consist of expressions of patriotic pride in English resourcefulness and bravery and contempt for Spain and Catholicism.

15. These narratives are written in a plain and lucid style that arises from the use of concrete diction and uncomplicated syntax. The rhetorical ornamentation which characterizes the literary prose of the age occurs only rarely; when it does it is usually restricted to alliteration, homely metaphor, or antithetical balance. Statements by several voyage writers indicate a conscious striving for simplicity of expression.

16. Stylistically the voyage narratives appear to be in the tradition of Sir Thomas More's *History of King Richard III* and John Foxe's *The Acts and Monuments*.

The voyage narratives fulfill the Elizabethan concepts of history in that they are relations of actual events, they are useful as guides for future voyages, they preserve for posterity the fame of great men, they include geographical information, and they are written in a style considered appropriate to history.

As biographies and autobiographies, the voyage narratives are on a par with many of those of their age in the extent of their coverage of a man's life, in the depth of characterization, and in their objectivity. In form and manner of presentation they are closely akin to those found in the *Acts and Monuments*.

As examples of narration, many accounts display a tightness of structure, a depth of characterization, a particularization of setting, and a realism that exceeds that of many Elizabethan novels.

Of the one hundred and seventy-six accounts considered, fifty-four appear to be of significant literary value by virtue of the effectiveness of their narration. These represent a considerable achievement by non-literary men who were able to convey vividly their personal experiences in a natural, forthright prose that was prophetic of a modern prose style.

682 pages. \$8.53. Mic 55-283

## MATHEMATICS

### COMPLETE IDEALS IN POLYNOMIAL RINGS

(Publication No. 12,879)

Barbara Jean Beechler, Ph.D.  
State University of Iowa, 1955

Chairman: Professor H. T. Muhly

Some of the arithmetic properties of the semi-group  $(\mathcal{Q}, > <)$  of complete ideals in the ring  $K[x, y]$  of polynomials in two indeterminates over an algebraically closed field are investigated. In particular, it is shown that if the operation ' $> <$ ' is the "b-multiplication" of Krull [W. Krull, *Beitrage zur Arithmetik kommutativer Integritatsbereiche*, Math. Zeit., vol. 41 (1936), pp. 545-577], then the semi-group is gaussian. Although this result is not new, the methods used here present a major simplification in the treatment as well as a point of view better suited to this type of problem. The results have previously been obtained by O. Zariski [O. Zariski, *Polynomial Ideals Defined by Infinitely Near Base Points*, Am. J. of Math., vol. 60 (1938), pp. 151-204] as a by-product of his investigation of base conditions. Later Zariski's results were treated by Seidenberg [A. Seidenberg, *Valuation ideals in polynomial rings*, Trans. Am. Math. Soc., vol. 57 (1945), pp. 387-425]. Our treatment is essentially different from either of these. The methods employed are arithmetic; the applications of Krull's results enable us to show that complete ideals behave under quadratic transformations in much the same manner as do valuation ideals, whereas previous authors were forced to make extensive studies of the valuation ideals in  $K[x, y]$  and, in the case of Zariski, also in the ring of formal power series.

43 pages. \$1.00. MicA 55-2160

### SYSTEMS OF LINEAR CONGRUENCES, AND LEFT-ASSOCIATIVITY OF MATRICES, WHOSE ELEMENTS ARE INTEGERS FROM AN ALGEBRA

(Publication No. 12,947)

Alton Thomas Butson, Ph.D.  
Michigan State University, 1955

A major part of this thesis is devoted to the problem of solving a system of linear equations or a system of linear congruences whose elements are integers from an algebra. By means of regular representations each of these systems is replaced by an equivalent system whose elements are in a principal ideal ring. A system of equations is replaced by a system of linear equations of a classical type whose solution is known. A system of congruences is replaced by a system of linear congruences whose elements are actually matrices over a principal ideal ring. This latter system is solved by a procedure analogous to that

employed in the classical case. Necessary and sufficient conditions are obtained for the existence of a solution whose elements are integers of the algebra. These conditions are in terms of elements of the principal ideal ring. This problem is completely solved - the main tool used being the regular representations.

Each matrix  $A$  whose elements are integers from an algebra has as a reduced regular representation a matrix  $s(A)$  whose elements are in a principal ideal ring. The remainder of the thesis is concerned with the possibility that a necessary and sufficient condition that  $A$  and  $B$  be left-associates is that  $s(A)$  and  $s(B)$  have the same Hermite form. The condition is a necessary one and will be shown sufficient when  $A$  and  $B$  are not divisors of 0. A problem for further research is whether the condition is sufficient when  $A$  and  $B$  are divisors of 0.

87 pages. \$1.09. MicA 55-2161

### ON THE FOUR-VERTEX THEOREM AND SOME OF ITS GENERALIZATIONS

(Publication No. 12,689)

Edwin Foote Gillette, Ph.D.  
Syracuse University, 1955

The Four-Vertex Theorem states that every oval has at least four vertices. An oval is a plane closed convex curve without double points and with continuous curvature. A vertex is a point on the curve at which the curvature attains an extremum. Several proofs of this theorem have been presented since the first published proof in 1909 by S. Mukhopadhyaya.<sup>1</sup>

This paper consists of two parts. In the first part an analysis is made of the Four-Vertex Theorem by considering several of the known proofs of the theorem and of certain related theorems. The proofs have been selected to show how the theorem has been proved by using not only methods of differential geometry but also methods of conformal geometry and of analysis.

In the second part we first prove a four-vertex theorem for spherical ovals by generalizing a proof due to G. Herglotz for the plane case.<sup>2</sup> Then we prove a four-vertex theorem for ovals on surfaces of constant Gaussian curvature. This has been done previously by S. B. Jackson<sup>3</sup> by mapping the oval onto a plane curve in such a way that the geodesics of the given curve are carried into the vertices of the corresponding plane curve. Our method is quite different and is a proof on the surface itself in which we use a generalization of a lemma due to Erhard Schmidt.<sup>4</sup> We define an oval on a surface as a simple closed convex curve in a simply connected domain of the surface and along which the geodesic curvature,  $k_g$ , is a differentiable function of the arc length. A domain is convex if any two points of the domain can be joined by one



and only one geodesic lying entirely in the domain. A point on the curve at which the geodesic curvature attains an extremum is called a vertex. The theorem proved is: Every oval on a surface of constant Gaussian curvature has at least four vertices. S. B. Jackson<sup>5</sup> has proved the following theorem: The distance circles of sufficiently small radius about a nonstationary point of the Gaussian curvature on a surface  $\Sigma$  have only two geodesic vertices. We prove a number of two-vertex theorems for such curves that give quantitative results concerning the size of their radii. 43 pages. \$1.00. MicA 55-2162

1. Mukhopadhyaya, S. "New methods in the geometry of a plane arc, I," *Bulletin of the Calcutta Mathematical Society*, I (1909), pp. 31-37.

2. Blaschke, Wilhelm *Vorlesungen über Differentialgeometrie*. New York, Dover Publications, 1945, vol. 1, pp. 31, 32.

3. Jackson, Stanley B. "The four-vertex theorem for surfaces of constant curvature," *American Journal of Mathematics*, LXVII, (1945), pp. 563-582.

4. Schmidt, Erhard, *Sitzungsberichte der Berliner Akademie der Wissenschaften*. (1925). p. 485ff.

5. Jackson, *op. cit.*, pp. 577-580.

#### GROUP METHODS in NORMAL MULTIVARIATE DISTRIBUTION THEORY

(Publication No. 13,058)

Alan Treleven James, Ph.D.  
Princeton University, 1952

Effective use is made of the symmetry of a sample of observations from the normal multivariate distribution, in deriving the various sampling distributions. The symmetry is expressed mathematically by the invariance of the distribution, and certain statistics, under the orthogonal group of transformations.

In part I, the relationship of the orthogonal group, and its two coset spaces, the Grassmann and Stiefel manifolds, to normal multivariate sampling theory is discussed. The use of the Blaschke differential forms to represent the invariant measures on the two manifolds, is illustrated by a derivation of the well known distribution of the canonical correlation coefficients in the null case. The distribution of  $n$  independent samples from a normal  $k$ -variate population is transformed into 3 independent distributions, namely, (a) essentially the Wishart distribution (b) the distribution of the linear subspace spanned by the sample when represented as  $k$  vectors in  $n$ -space; this is given by the invariant measure in the Grassmann manifold, (c) the invariant distribution of a  $k \times k$  orthogonal matrix which determines the orientation of the  $k$  vectors in the  $k$ -dimensional linear subspace.

Part II gives a derivation of the non-central Wishart distribution. It is obtained by averaging a certain function over the orthogonal group. The average is obtained by noticing that averaging over the group is a projection of function space which commutes with certain group-invariant operators of the Laplace type. Thus a differential equation  $\Delta f = f$ , where  $\Delta$  is the Laplace operator, satisfied by the function to be averaged, is also satisfied

by the averaged function. On transforming the Laplace operator to new coordinates, we get a system of second order partial differential equations which yield an effective system of recurrence relations for the coefficients of the multiple power series of the averaged function. The non-central Wishart distribution is the central distribution multiplied by this function and a constant.

The average of the function has another application. It constitutes a generating function for the integral of any polynomial in the elements of an orthogonal matrix over the manifold of the orthogonal group.

74 pages. \$1.00. MicA 55-2163

#### DIFFERENTIABLE APPROXIMATIONS TO LIGHT INTERIOR TRANSFORMATIONS

(Publication No. 12,593)

John William Jewett, Ph.D.  
University of Michigan, 1955

It has been proved by Stoilow that every analytic function is topologically equivalent to a light interior transformation and, conversely, that every light interior transformation is topologically equivalent to some analytic function. Thus lightness and interiority are the fundamental topological properties of analytic functions. However light interior transformations need not be differentiable.

The problem attacked in this paper is to approximate a given light interior transformation  $f$  of a domain in the plane by differentiable light interior transformations which resemble  $f$  as much as possible.

In Chapter I of this paper the first step is to prove that a continuous transformation  $f$  of a domain  $D$  is light interior if and only if there is a locally finite triangulation of  $D$  such that  $f$  is topological on each closed simplex of  $D$  and such that simplexes having one simplex in common disjoint images. This result is used, together with a process of refining triangulations and approximating curves by polygons, to find piecewise linear approximations. More precisely it is proved that if  $D$  is a domain in the plane,  $\epsilon$  is a positive number and  $f$  is a function continuous on  $\bar{D}$  and light interior on  $D$  into the plane, then there exists a locally finite triangulation  $T$  of  $D$  and a function  $b$  approximating  $f$  to within  $\epsilon$  such that  $b$  is continuous on  $\bar{D}$ , light interior on  $D$  into the plane, and linear in  $x$  and  $y$  on each closed simplex of  $T$ . Moreover the function  $b$  has the same topological critical points as  $f$  and agrees with  $f$  on the boundary of  $D$ .

In Chapter II a process of smoothing is applied to this function  $b$  to give the main theorem of this paper - that given a function  $f$  having the properties assumed above for  $f$ , then there exists a light interior transformation  $g$  approximating  $f$  to within  $\epsilon$  such that  $g$  is twice partially differentiable in  $x$  and  $y$ , has the same topological critical points as  $f$ , and agrees with  $f$  on the boundary of  $D$ .

Finally this result is used to prove a similar approximation theorem for a class of real valued interior functions defined on a plane domain.

41 pages. \$1.00. MicA 55-2164

LOCALLY A-CONVEX TOPOLOGICAL VECTOR  
LATTICES AND THEIR REPRESENTATIONS

(Publication No. 12,603)

Robert Garlin Kuller, Ph.D.  
University of Michigan, 1955

Abstract partially ordered and lattice ordered vector spaces were introduced by Kantorovitch in 1937, and by Freudenthal in 1936. At first, the algebraic aspects were the predominant ones; convergence notions and topologies were defined in terms of order properties, and with considerable success, for in many concrete cases the topologies so defined agreed with natural topologies occurring in those cases. This was especially true when additional hypotheses, such as order completeness, or the existence of an order unit of some sort, were imposed. A second approach, more pertinent to this study, is to postulate initially a topology on the vector lattice, but to require it to cooperate with the algebraic operations in desirable ways; in particular, these operations must be continuous if the topology is to be at all useful. Abstract Banach lattices, defined as lattice ordered Banach spaces in which the ordering and the norm are related by the condition  $|x| \leq |y| \Rightarrow \|x\| \leq \|y\|$ , are examples. In 1941 Kakutani introduced the abstract M-space, and the abstract L-space, each a type of Banach lattice, and proved representation theorems for them. Namely, every abstract M-space is a well defined subspace of the Banach lattice of all continuous real valued functions on some compact Hausdorff space, and every abstract L-space is the Banach lattice of all Lebesgue integrable functions on some totally disconnected compact Hausdorff space.

The locally convex topological vector space, a natural generalization of the Banach space, and the fact that every complete locally convex vector space is a projective limit of Banach spaces, have been known for some time. The notion of the Banach algebra, or normed ring, was defined in 1941; its properties and representations have been subjects of much interest since then. In 1952, locally multiplicatively convex topological algebras, the generalizations of Banach algebras, were introduced and studied by means of the projective limit representation and the known theorems about normed rings.

The purpose of this investigation is to carry through a similar program for Banach lattices. Namely, the following problems are posed: 1) Formulate suitable definitions of the locally convex extensions of the Banach lattice, and its specializations, the abstract M-space, and the abstract L-space. 2) By means of the projective limit device, and the theorems of Kakutani, obtain as much information as possible about the representations of these objects.

The first problem is not difficult; the spaces defined are called locally a-, a-m-, and a-l-convex topological vector lattices. The representation theorems are intricate. Briefly, for any locally a-m-convex topological vector lattice E, it is possible to exhibit a Hausdorff topological space X, such that E is a space of real valued continuous functions on X, and for any locally a-l-convex topological vector lattice F, it is possible to exhibit a totally disconnected Hausdorff space Y, such that F is a space of real valued functions on Y which are Lebesgue integrable on all subsets of Y of finite measure. Certain auxiliary results, some new, and some merely different

formulations of known facts, are given, especially on the subject of Banach lattices and their ideals.

57 pages. \$1.00. MicA 55-2165

THE USE OF A CERTAIN LINEAR ORDER STATISTIC,  
RELATED TO THE MEAN DIFFERENCE, AS AN  
UNBIASED ESTIMATE OF THE STANDARD DEVIATION  
IN FINITE AND INFINITE POPULATIONS

(Publication No. 12,610)

Fred Wilbur Lott, Jr., Ph.D.  
University of Michigan, 1955

The purpose of this dissertation is to develop the properties of an estimate of the standard deviation of a given population that arises from certain considerations in order statistics. The estimate is shown to be related to Gini's mean difference.

Finite populations are considered first. The constant needed to make the estimate unbiased and the variance of the estimate are given. Some assumption concerning the form of the population, but not involving the unknown location and scale parameters, must be made. The results are illustrated with examples of various types of finite populations.

It is shown how the continuous case is related to the finite situation by obtaining the variance of the estimate for a continuous distribution from the results of the finite case. Similar techniques are used to establish the third moment for a continuous distribution. The exact sampling distribution for any sample size in samples from a rectangular population is derived through the use of the characteristic function. When the universe is normal, in addition to a knowledge of the first three moments, it is known that the estimate is asymptotically normal.

The variance of the estimate is compared with that of four other estimates of standard deviation suitable for use in small sample sizes and with that of six other estimates that might be considered when the sample size is large under the assumption of a normal population. The efficiency of the estimate is about 97.8%, and for small samples the variance is almost as small as that of the estimate based on the sum of squares.

Since the estimate can be written in several different ways, computational forms are discussed. For small sample sizes, a computational technique is set up that involves the weighted differences of mirror ranks of order statistics, the weights being simple integers.

It appears that this estimate, due to its relatively low variance and its ease of computation for small sample sizes, has some merit as a method of estimating the standard deviation of a population.

117 pages. \$1.46. MicA 55-2166



# SETS OF RADIAL DISCONTINUITY OF ENTIRE AND MEROMORPHIC FUNCTIONS

(Publication No. 12,632)

James Maxwell Osborn, Ph.D.  
University of Michigan, 1955

The set of radial discontinuity of an entire or meromorphic function  $f(z)$  is the set of real numbers  $x$ , reduced modulo  $2\pi$ , for which the radial limit  $\lim_{r \rightarrow \infty} f(re^{ix})$  does not exist. (The convention is adopted that if

$$\lim_{r \rightarrow \infty} f(re^{ix}) = \infty,$$

the radial limit exists.) This dissertation is devoted to the problem of determining which sets of directions are sets of radial discontinuity of entire and meromorphic functions.

First necessary conditions that a set be a set of radial discontinuity (for either class of functions) are investigated. Continuity alone of the functions implies sets of radial discontinuity must be of type  $G_{\delta\sigma}$ . With the use of Julia directions, of a principle involving Baire category due to Bagemihl and Seidel, and of an approximation theorem of Alice Roth further necessary conditions are obtained, such as that if a set of discontinuity less its interior is of the first category, it is nowhere dense.

Entire functions are constructed with certain prescribed sets of radial discontinuity by forming appropriate infinite series of certain special functions which are defined by integrals of Cauchy type. Such sets are arbitrary open sets, arbitrary denumerable closed sets, certain closed and "almost" closed sets, and finite unions of disjoint sets of the preceding types. Meromorphic functions are constructed with arbitrary sets of type  $G_{\delta}$  as sets of radial discontinuity. The method used is to consider sums of the form  $\sum_n B_n/(z - z_n)$ , where the points  $z_n$  are chosen appropriately near the rays on which radial discontinuity is sought. Approximation theorems of Alice Roth are used to show that an arbitrary nowhere dense set of type  $G_{\delta\sigma}$  is a set of radial discontinuity. With the aid of this proposition it is shown that any set which is the union of a nowhere dense set of type  $G_{\delta\sigma}$  and a set of type  $G_{\delta}$  is a set of radial discontinuity of a meromorphic function. A weaker theorem of this type is obtained for entire functions.

For both classes of function it is shown that a necessary and sufficient condition that a set of type  $F_{\sigma}$  be a set of radial discontinuity is that the set less its interior be nowhere dense. 69 pages. \$1.00. MicA 55-2167

## MINERALOGY

# THE HYDROTHERMAL SYNTHESIS OF HYDROGARNET, SPHENE, AND RELATED SILICATES

(Publication No. 13,325)

James Allan Fraser, Ph.D.  
University of Minnesota, 1955

Major Advisor: John W. Grune

Stability relations of epidote,  $\text{Ca}_2(\text{Al,Fe})_3\text{Si}_3\text{O}_{12}(\text{OH})$ , anorthite,  $\text{CaAl}_2\text{Si}_2\text{O}_8$ , hydrogrossularite,  $\text{Ca}_3\text{Al}_2(\text{SiO}_4)_{3-m}(\text{OH})_m$ , sphene,  $\text{CaTiSiO}_5$ , and diopside,  $\text{CaMgSi}_2\text{O}_6$ , were investigated by alteration and synthesis in hydrothermal systems. Water-soluble salts, chiefly those of calcium, sodium, or potassium, were added in most of the experiments in order to hasten the reactions and bring about equilibrium. Some of the runs were designed to test the effect of relatively low water-vapor pressures. Bombs of the Morey type, in which the desired pressure was determined by the degree of filling, were used both for high and low pressure experiments. Experiments were also made in an open-tube furnace at a steam pressure of one atmosphere. The duration of most of the runs was about five days but the period was varied to suit the temperature conditions of individual experiments. Identification of minerals in the products of the experiments was made from X-ray powder patterns, and in some cases by optical examination.

Hydrogarnet was formed readily from anorthite or epidote in strong calcium hydroxide solutions, and from

fused-epidote glass in neutral and alkaline solutions in a temperature range from 200°C to 500°C at pressures of 16 bars to 500 bars. Hydrogarnet was also formed from a mixture of anorthite and calcium chloride at 600°C and a water-vapor pressure of one atmosphere. The use of excess silica in some of the runs was found to inhibit or prevent the development of hydrogarnet. Hydrogarnets synthesized under different conditions exhibited unit cells of different sizes. Increases in cell sizes were observed for synthetic hydrogarnets which had been subjected to additional hydrothermal experiments, even in cases where the temperatures and pressures obtaining did not differ from those of the original synthesis. The size of the unit cell appears to be a function of at least four variables: temperature, pressure, composition, and time.

Sphene crystallized from a mixture of anatase and fused-epidote glass in saturated calcium bicarbonate solutions between 300°C and 450°C. The best sphene was obtained at about 300°C; at higher temperatures or in calcium-rich solutions of higher pH, hydrogarnet and anorthite developed rather than sphene.

Diopside was formed in neutral and basic carbonate solutions from fused-diopside glass at temperatures of 470°C or more. Below 470°C diopside did not crystallize from the fused material but in other experiments at similar temperatures, diopside present in the original charge persisted without alteration, possibly as a metastable phase.

Other minerals synthesized hydrothermally in the course of this study include amesite,  $\text{Fe}_4\text{Al}_2\text{Si}_2\text{Al}_2\text{O}_{10}(\text{OH})_8$ ,

hedenbergite,  $\text{CaFeSi}_2\text{O}_6$ , and a mineral resembling epidote but having a slightly larger unit cell. Amesite was prepared from anorthite in aluminum chloride solution at  $300^\circ\text{C}$ ; hedenbergite was obtained from fused-epidote glass in sodium chloride solution to which silica had been added, at a temperature of  $450^\circ\text{C}$ . The mineral resembling epidote was formed from anorthite in saturated calcium hydroxide solution: the exact temperature of formation is unknown since the bomb was dry when opened. The maximum temperature reached during the run was  $450^\circ\text{C}$ .

The failure of epidote,  $\text{Ca}_2(\text{Al,Fe})_3\text{Si}_3\text{O}_{12}(\text{OH})$ , or grossularite,  $\text{Ca}_3\text{Al}_2\text{Si}_3\text{O}_{12}$ , to crystallize in any of the experiments is ascribed to the use of relatively high water-vapor pressures. It is suggested that these minerals may be stable in systems where the water-vapor pressure is low, at temperatures and confining pressures comparable to those at which anorthite and hydrogrossularite are produced in high water-vapor pressure.

99 pages. \$1.24. MicA 55-2168

#### LOW TEMPERATURE PLAGIOCLASES

(Publication No. 13,061)

James Robert Smith, Ph.D.  
Princeton University, 1954

The relations between optical properties and composition in a group of samples of plagioclases from pegmatites, granites, stratiform mafic intrusions, and metamorphic rocks have been studied; the samples cover the entire composition range from albite to anorthite. For each sample, mean values of the principal refractive indices were determined to a probable accuracy of  $\pm .0003$ ; the mean value of total birefringence was determined to a probable accuracy of  $\pm .0001$ ; and the mean value of the optic axial angle was determined to a probable accuracy of  $\pm .3^\circ$ . The accuracy of the mean values of the optical properties is the result of the precision of the special techniques which were applied to the individual optical measurements, and of the fact that the optical properties of numerous grains from each analysed sample were

averaged to take into account the variation of composition of the plagioclase in each sample. The consistency of the results indicates that the errors in the quoted compositions of the samples, which were calculated from the chemical determinations of lime and alkalies, are negligible.

The refractive index - composition relations, the total birefringence - composition relations, and the optic axial angle - composition relations are shown experimentally to be linear to a very close approximation in certain composition ranges, and they are assumed to be so throughout the entire composition range. The curves depicting the relations then take the form of straight-line segments between which there are six postulated discontinuities at the compositions An 11-16, An 22.5, An 37-40, An 54, An 60-63, and An 86-90 (all stated as mol percent anorthite). This form of the solution is entirely consistent with the estimated accuracies of the mean values of the optical properties, and with the mathematical relationships between refractive indices, optic axial angle, and total birefringence; errors in the chemical analyses do not contribute to the form of the solution because closely analogous solutions are obtained by plotting certain optical properties against other optical properties.

The shapes of the curves in the regions of discontinuity are subject to some uncertainty which may be resolved by further work. The solution is in part subject to change when similarly accurate and extensive data become available for plagioclases of different origins and thermal histories. With these reservations, the postulated optical discontinuities at An 11-16 and An 86-90 are interpreted as marking the departure from true isomorphous substitution on either end of the series, which is in accordance with the results of X-ray investigations by others of the structures of plagioclases. The other postulated discontinuities cannot be rigorously explained on the basis of the available evidence, but they imply that the samples in the composition range An 11-16 to An 86-90 do not represent an ideal isomorphous series, which is also in accordance with X-ray evidence. The shape of the 2V-composition curve suggests that plagioclases of low-temperature origin may be divided into two distinct groups, one of composition An 0 to An 37-40 and the other of composition An 37-40 to An 100.

86 pages. \$1.08. MicA 55-2169

#### MUSIC

##### THE MOTETS OF THE CODEX IVREA: VOLUME I: COMMENTARY. VOLUME II: TRANSCRIPTIONS.

(Publication No. 13,053)

Mildred Jane Johnson, Ph.D.  
Indiana University, 1955

The purpose of this study is to present the 37 motets of the fourteenth-century Codex Ivrea in modern notation, together with a commentary. Besides the analytical study of the music, the commentary includes historical and biographical material, and some remarks concerning the texts.

The motets clearly show the stylistic traits known to be typical of the fourteenth century. They are still influenced by modal rhythms, particularly in the upper parts. All but four of the compositions are isorhythmic, and are thus illustrative of the dominant structural principle of the fourteenth-century motet. Nearly all of the pieces contain sections in hocket, and many of these show the variety and complexity attained by the hocketing technique, which reached its high point in this period. Typical of fourteenth-century structure, in addition, is the prevalence of isoperiodic divisions in the upper parts.

The dominance of rhythmic concepts in this period perhaps explains the almost complete lack of melodic unifying



devices such as repeated melodic phrases, and the abundance of certain rhythmic figures which result from the almost universal use of 6/8 and 9/8 meters. Rhythm is also the basis for the prevailing textural aspect of these motets: a complexity in the upper parts which arises from a greater number of notes to a beat, as opposed to the simplicity of the lower parts with their lesser number of notes in large values.

The harmonic picture is varied, but one tendency seems clear: a general growth away from the dominance of the perfect consonances towards the imperfect ones on the strong as well as the weak beats.

Many of the motets have partial signatures and nearly all show some use of *musica ficta*, but neither signatures nor accidentals are used in a consistent manner. A tendency in the general direction of "major-minor" sound, away from a modal sound, is observed. The notation of the motets is that of most fourteenth-century French music: the mensural notation derived from the thirteenth century, clarified and systematized largely by Franco and Petrus de Cruce and widely developed and extended by Philippe de Vitry.

Four compositions, nos. 15, 23, 36 and 37, do not belong to the general picture presented by the motets, and are discussed in a separate chapter.

In some of the motets the fifteenth-century style seems to be anticipated, especially in motet 12, *Apolinis*, with its smoothly-flowing, largely triadic sound, and motet 29, *Petre Clemens*, with its unique imitative entries at the beginning.

Five motets of de Vitry and four of Machaut distinguish the manuscript; some of the other motets, however, are of such quality that one regrets their anonymity.

459 pages. \$5.74. MicA 55-2170

## AN OBJECTIVE STUDY OF BREATHING FOR SINGING

(Publication No. 13,227)

William Ernest Ross, Ed.D.  
Indiana University, 1955

Chairman: William H. Fox

### Procedure

The purpose of the study was to correlate the breathing profiles of trained and untrained singers, in order to determine whether differences in breathing patterns may explain variations in voice quality, range, loudness, and duration.

### Subjects

One hundred subjects in all, 55 male and 45 female, were examined. The age of the male subjects ranged from 17 to 62 years of age; the age of the female subjects ranged from 17 to 25 years of age. The average age of the males was 22 years; the average age of the females was 18 years. Out of the 100 subjects examined, 57 had had vocal training, while 43 had had no previous training.

### Methods and Techniques

The three pneumographs were placed on each subject in order to measure breathing at three levels: the thoracic or intercostal level, the high abdominal or medial level, and the low abdominal level.

**Vocalization and song.** The first step was the recording of each subject's breathing profiles during vocalization. The second step was the recording each subject's breathing profiles while singing a song. The same vocalizing procedure was followed by all subjects; the same song was sung by all the subjects in a key to fit the singer.

**Loudness.** A check was made with the decibel meter during the singing of the song, on how loudly and how softly each subject sang. The highest reading in decibels was recorded.

**Quality.** Immediately following the vocalization and song procedure, a subjective appraisal was made by the experimenter of the voice quality of each subject according to the following levels of grading: A, above average good quality; B, average good quality; C, below average good quality.

**Duration.** Following the song procedure, a test was made of how long each subject could sustain the broad AH vowel sound. The subject held this sound as long as possible, and the time was measured in seconds with a stop watch.

**Vital capacity.** The final test was to determine how much air a subject could inhale and then blow into a water cylinder type spirometer. At least three trials were made. More than three trials brought no further increase in the amount that a subject could blow into the spirometer.

### Findings

Although there were absolutely no differences between males and females in intercostal breathing, there existed differences far beyond the one per cent level of confidence in high abdominal breathing under both vocalization and song.

The correlations between the breathing measures for vocalization and those for song were significant far beyond the one per cent level.

There were no significant correlations between the breathing measures and the spirometer readings, or between the breathing measures and range.

There were significant relationships between the breathing measures and duration, loudness, and quality.

### Conclusions

Although there was no difference in the intercostal measure of breathing between men and women but a great difference in the high abdominal measure of breathing between men and women, it was concluded that they were not sampled from the same population. Consequently all analysis was done separately for female subjects and for male subjects.

Any conclusions reached on the basis of an analysis of vocalization with other variables — quality, range, duration, and loudness — could be expected to hold also for song.

The general conclusion was that intercostal high abdominal breathing is conducive to the best results in singing for both male and female singers. The definite relationships between the measures of breathing — intercostal, high abdominal, and low abdominal — tend to support that contention.

93 pages. \$1.16. Mic 55-284

# A STUDY OF THE MUSICAL CONFIGURATIONS, SYMBOLS, TERMS, AND WORDS FOUND IN BASIC MUSIC TEXTS AT THE FOURTH GRADE LEVEL

(Publication No. 13,232)

Edra Meads Smiley, Ed.D.  
Indiana University, 1955

Chairman: William H. Fox

## Introduction

It is important that textual materials be suitable to the development of those who are to use them. As boys and girls begin the experiences which are intended to lead them from music reading readiness to independent sight reading, they require attractive, interesting music material which is within their capacity to use effectively.

## Purposes of the Study

It is the general purpose of this study to examine certain aspects of a number of music textbooks at the fourth grade level and to compare the findings with the objectives and teaching emphases as postulated in professional literature, courses of study in elementary music, and standardized criteria. The aspects to be studied fall into two categories: those having to do with the teaching of melodic sight reading, and those having to do with the communication from the textbook by symbol, term, and word.

## Procedure

Several recent professional books on elementary music education and several courses of study in elementary music were examined for their references to the use of tonal configurations in teaching music reading at the fourth grade level. A frequency count was made of the tonal configurations found in the representative fourth grade music books. The findings from the three sources were compared. The same procedure was followed in studying musical symbols and foreign terms of expression.

Finally, the four basic texts were examined for all English words referring to music. These words were checked for probability of understanding in the general and in the juvenile word lists of Thorndike and Lorge. Words which might be particularly confusing to children were looked up in a children's dictionary to find out whether the meanings of the musical sense of the words were given.

## Conclusions

Careful examination of the data and the literature led to the following conclusions.

All professional literature examined in this study, except one non-technical book which did not deal with the problem, favors using the tonal configuration rather than a note-by-note approach in the teaching of music reading. All courses of study used in the present study advocate the use of tonal configurations in the teaching of music reading.

There are so many different tonal configurations used in the reading songs in each of the four basic texts that it would be an impossible task for the fourth grade child to memorize them all. No evidence is found in any of the four

basic textbooks that the authors tried to conform to any set list of tonal configurations in the reading song materials.

The authors of the representative professional literature agree generally that the teaching of musical symbols is important at the fourth grade level. They do not agree on the method or emphasis of the teaching. The courses of study of the six representative cities show the same range in the method and emphasis of teaching musical symbols as do the authors of the professional literature reviewed. The approach to the teaching of symbols varies from formal to informal. The four basic texts vary greatly in the use of musical symbols.

The professional literature and the courses of study have beautiful singing as a goal, but they do not advocate the teaching of foreign terms of expression at the fourth grade level. Planned use of terms is found in only one of the texts, which explains and uses six terms denoting volume.

The data do not reveal vocabulary planning in the basic texts. 226 pages. \$2.83. MicA 55-2171

# THE STATUS OF MUSIC IN THE ELEMENTARY SCHOOLS IN WEST VIRGINIA

(Publication No. 13,234)

Myllan Smyers, Ed.D.  
Indiana University, 1955

Chairman: William H. Fox

## The Problem

The purpose of this study was to determine the status of music instruction in the elementary schools in West Virginia. The subsidiary problems were to survey: facilities, aids, and materials; pre-service, professional, and in-service training; teaching responsibilities and time allotment; teaching procedures; teaching assistance and supervision; and attitudes and opinions of the teachers toward music and music education.

## Methods and Procedures

The elementary schools in West Virginia were classified on the basis of the number of rooms, and a random sample of approximately 12 per cent was drawn in each group. All counties but one were represented in the drawing.

Data were gathered by means of a questionnaire check list which was sent to all teachers of grades 1 to 6 in each school drawn in the sample and, of these 348, or 29 per cent, were completed and returned. The data were tabulated using two control items as criteria: number of rooms and years of teaching experience.

## A Brief Summary of Findings

Many elementary teachers in West Virginia who are attempting to teach music are inadequately prepared for this professional responsibility. Only 15 per cent of the teachers believe their preparation to teach music is adequate.



The elementary teachers who work under the most adverse instructional conditions are likewise the teachers who have no supervisory assistance in music.

The classroom teachers consider music very important in the lives of children, and they would place more emphasis upon it in the training of teachers.

#### Conclusions

It is apparent that almost all of the classroom teachers teach music in their regular classrooms. Only a few schools have a special room for music instruction. Data in this study show that teachers are considerably handicapped with grossly inadequate equipment. This problem is most acute in the one-room schools, although only a few of the large schools are adequately supplied.

Only a few teachers reported having experienced a music program that contained many and varied activities when they were elementary pupils.

Vocal activities provided music experiences for most of the elementary teachers while they were students in high schools. Only a few had participated in band in high school. However, about half of the teachers discontinued singing in vocal groups after entering college.

Apparently the present required music courses are not sufficient for many prospective elementary teachers with their meager musical background; only one in seven claim that their training is adequate.

The elementary school children receive an average of sixty-eight minutes of music instruction each week. A large portion of the music time is used for listening to music and informal group singing. The classroom teachers who carry the greater burden of music instruction feel that the number of music activities in their programs is too few.

Many teachers feel that their lack of confidence to teach music is due to insufficient training in music and inadequate supervisory assistance, facilities, and supplies.

171 pages. \$2.14. MicA 55-2172

## PHARMACOLOGY

### STUDIES ON AUROTHIOGLUCOSE OBESITY

(Publication No. 12,699)

Gerald Friedman, Ph.D.  
Syracuse University, 1955

Studies on aurothioglucose (ATG) obesity in the mouse suggest that the metal is crucially involved in the production of obesity. The first three parts of this study include a) microchemical determinations of the tissue and body fluid distribution of gold in mice injected with obesity-inducing doses of aurothioglucose, b) the gold distribution patterns of ATG-injected obese mice with those of ATG-injected non-obese mice at various time intervals following injection, and c) a comparison of renal and hepatic gold concentrations between mice injected in the fasted state and those injected in the fed state.

A modification of Block and Buchanan's method for the microdetermination of gold in biological tissues and fluids was adapted for use in the mouse.

In the first part of this study results obtained with a dose of .8 mg./Gm. of body weight at time intervals ranging from 15 minutes to 3 hours indicated that the peak plasma level occurred between 30 minutes and one hour following intraperitoneal injection. The concentration of gold in the kidney reached a maximum at approximately 30 minutes post injection, while the highest concentration of gold in muscle was attained between 30 minutes and one hour. Concentrations of gold in the liver remained relatively constant at all time periods throughout the 3 hours. Peak concentrations in the brain appeared one hour following injection. The kidneys showed the highest concentration and the liver next highest. By the end of 3 hours the absolute gold content of the livers exceeded that of the kidneys. At 2 and 3 months following injection of ATG in doses of .8 mg./Gm. the sole organ containing demonstrable amounts of gold was the liver. Even upon pooling 4

sets of spleens, brains, kidneys, muscle samples, plasma and red blood cells the only gold that could be recovered was a slight trace in pooled spleen samples. No demonstrable difference in concentration of gold was observed in livers of obese and non-obese ATG-injected mice one and two months following injection.

Previous investigators indicated that prior starvation reduced mortality from ATG. The third part of the study concerned a comparison of hepatic and renal concentrations of gold (injected as ATG) between groups of mice injected in the fed and fasted conditions. Results obtained 2 hours following ATG injection indicate that both hepatic and renal concentrations and the total gold content of these organs are significantly greater in fasted mice.

The final section of this study include a series of three experiments. The initial experiment involved tumorigenesis in ATG-injected animals. Twenty per cent of injected obese mice and ten per cent of injected non-obese mice developed mammary tumors six to nine months post injection. None of the untreated mice developed tumors in this ten month controlled study. In the second of these experiments the effect of hyperphagia on the skeletal growth of young rapidly growing mice was studied in three groups of mice. No gross skeletal differences were apparent among ATG-injected obese mice, ATG-injected non-obese mice and an un-injected control group. The final study involved the effects of simultaneous injections of epinephrine and ATG upon decreasing toxicity and increasing the incidence of obesity in treated mice. Fifty per cent of mice injected in the fed state survived an LD<sub>50</sub> dose of ATG. The incidence of obesity was increased from an expected 33 per cent to 86 per cent of the surviving mice.

157 pages. \$1.96. MicA 55-2173

# THE ROLE OF MONOAMINE OXIDASE IN THE PHARMACOLOGY OF ADRENERGIC COMPOUNDS

(Publication No. 13,088)

Ernest Charles Griesemer, Ph.D.  
Northwestern University, 1955

Many investigators have reported a relationship between inhibition of the enzyme monoamine oxidase and potentiation of physiological responses to epinephrine. It has been suggested that the enzyme serves as an inactivating mechanism for epinephrine in much the same manner as choline esterase serves for acetylcholine.

The discovery of the potent monoamine oxidase inhibiting properties of iproniazid offers a means of determining the importance of this enzyme in physiological processes. The inhibition of monoamine oxidase by iproniazid should alter the physiological response to epinephrine in the direction of a prolonged response if the enzyme normally serves as an inactivating mechanism.

The contractile responses of the cat's nictitating membrane to tyramine and B-phenylethylamine were greatly potentiated by iproniazid. This potentiation was directly related to monoamine oxidase inhibition as shown by the fact that it took two hours for the onset of complete inhibition of the enzyme and the same time course for maximum potentiation of the response to either amine. The relaxation responses of the non-pregnant cat's uterus to tyramine and B-phenylethylamine were potentiated by iproniazid and the onset of maximum potentiation was the same for this tissue as it was for the cat's nictitating membrane. Epinephrine, levarterenol, serotonin, hydroxytyramine and tryptamine were all studied to determine whether or not iproniazid would alter the cat nictitating membrane responses to them. There was no affect of iproniazid on the responses to these agents.

Studies were made of the influence of iproniazid on epinephrine induced hyperglycemia in the rabbit, epinephrine induced relaxation of the non-pregnant cat uterus, and epinephrine induced contraction of the circular smooth muscle of the rabbit aorta. None of these responses were potentiated by iproniazid.

The ability of iproniazid to block the biological inactivation of epinephrine has been demonstrated. Iproniazid administered to cats or guinea pigs completely prevented the *in vitro* inactivation of epinephrine by liver tissue.

Interference by iproniazid with the normal responses to epinephrine has been demonstrated in the contractions of the cat's nictitating membrane, epinephrine induced hyperglycemia in the rabbit, and contractions of the rabbit aorta circular smooth muscle. Epinephrine induced relaxation of the non-pregnant uterus of the cat was not altered by iproniazid.

The blockade of epinephrine induced contractions of the rabbit aorta smooth muscle strips which is produced by iproniazid is readily reversible. It is probably unrelated to the monoamine oxidase inhibiting activity of iproniazid.

Evidence was reported to indicate that ephedrine, pyribenzamine, pyrogallol, and cocaine do not potentiate the responses of the cat's nictitating membrane or blood pressure to epinephrine by inhibiting monoamine oxidase. The ability of cocaine to potentiate the response of the rabbit aorta to epinephrine is eliminated by the blocking action of iproniazid.

It is concluded that while monoamine oxidase may play

a role in the ultimate destruction of epinephrine in the body, this process does not limit the persistence of the biological response to epinephrine. Other, more rapid processes must, therefore, precede the oxidative deamination.

In the case of certain simpler amines such as B-phenylethylamine and tyramine, oxidative deamination appears to be a limiting process.

In addition iproniazid appears to possess some slight adrenergic blocking properties.

91 pages. \$1.14. MicA 55-2174

# ON THE MECHANISM OF THE VASCULAR ACTION OF MORPHINE

(Publication No. 12,578)

Jane Haggart, Ph.D.  
University of Michigan, 1955

The purpose of this study is to further characterize the marked and rapid fall in arterial pressure which follows intravenous morphine administration in the dog.

The experiments are distributed into three groups. Those of the first were designed to test the hypothesis that morphine hypotension results from the release of histamine. In the second group morphine analogues and compounds unrelated to morphine were screened for their influence on blood pressure, morphine hypotension, and acute vascular tolerance to morphine. In most cases a compound was tested in only one anesthetized animal. In the third group the effect of intra-arterial morphine administration on blood flow in the innervated and acutely denervated limb was determined by differential manometer measurements.

The following results were obtained:

Group 1. Dogs rendered relatively tolerant to the nervous and gastrointestinal effects of histamine by repeated histamine administration exhibited some nervous and gastrointestinal tolerance to morphine. Tolerance to morphine conferred no tolerance to histamine. Partial vascular tolerance to injected histamine, induced by antihistaminic agents or by repeated histamine administration, was accompanied by vascular tolerance to morphine, but the degree of vascular tolerance to morphine was independent of the degree of histamine vascular tolerance. The intravenous administration of "oxidized morphine" to dogs markedly elevates plasma histamine activity.

Group 2. The hypotensive effects of 1 and 4 mgm./kgm. of intravenous morphine are similar except in duration. The hypotensive effects of 1 mgm./kgm. of morphine were equivalent in animals anesthetized with either barbital or pentobarbital. Intravenous nalorphine and "oxidized morphine," and probably intravenous ephedrine and intravenous diphenhydramine with Tween 20 prevented the development of typical hypotensive responses to subsequent intravenous morphine injections. Inhalation of oxygen did not alter depressor responses to morphine.

Nalorphine and "oxidized morphine" evoked depressor responses in control animals. Nalorphine had a pressor effect, even in the presence of curare and tetraethylammonium, in animals rendered tolerant to the vascular effects of small intravenous morphine doses.

Group 3. The intra-arterial injection of 10 to 50 microgm./kgm. of morphine into innervated or denervated



limbs produced local increases in blood flow. Repeated injection of the same morphine dose at the same site resulted in gradually diminished blood flow responses.

Intravenous ephedrine prevented blood flow responses to intra-arterial morphine.

Blood flow responses to 10 microgm./kgm. of intra-arterial morphine and depressor responses to 1 mgm./kgm. of intravenous morphine were present one hour after the subcutaneous injection of 20 mgm./kgm. of morphine sulfate, but were prevented by 40 mgm./kgm. injected subcutaneously two hours before. Repeated

intravenous morphine administration abolished the blood flow response to intra-arterial morphine.

It is concluded that direct peripheral vasodilatation is an essential factor in the development of morphine hypotension in the dog and that peripheral tolerance to the vasodilator effect is at least one contributing factor in the development of tolerance to morphine hypotension. Possible mediation of the peripheral dilator effect by liberated histamine has not been eliminated or confirmed.

105 pages. \$1.31. MicA 55-2175

## PHILOSOPHY

### THE CONCEPTS OF RIGHT AND OUGHT IN THE PHILOSOPHIES OF G. E. MOORE, SIR WILLIAM DAVID ROSS, AND A. C. EWING

(Publication No. 12,749)

Clifford Tange Hanson, Ph.D.  
The University of Nebraska, 1955

Adviser: Charles H. Patterson

In this dissertation I have attempted to state and evaluate the views of G. E. Moore, W. D. Ross, and A. C. Ewing on the concepts of right and ought. They agree that naturalism is not able to present any definitions of ethical terms which conform to common sense usage. Against the sceptic, they claim that at least some of our ethical judgments state something which is true. They also reject all metaphysical definitions of ethical terms. Moore and Ewing do allow that some ethical terms may be definable in other ethical terms. The three also agree that intuition is needed both to recognize ethical concepts and also to apply these concepts to particular acts or states of affairs.

In spite of these agreements their views do diverge. Moore claims in *Principia Ethica* that 'good' is indefinable and that 'right' and 'ought' are definable in terms of 'good.' In *Ethics* he modifies this view and suggests that an act is right because it produces as much good as possible. In both of these books he indicates the importance of being able to discern goodness in its various degrees in order to discover what is right. Later in his life G. E. Moore comes very close to accepting an emotive theory.

Ross claims that 'right,' 'ought,' and 'good' are indefinable. He rejects all naturalistic attempts to present a ground theory and also Moore's theory in *Ethics* that optimificity is the only ground of rightness. Instead he claims there are several grounds of rightness which he calls *prima facie* duties.

Ewing attempts to define 'good' in terms of 'ought.' He says that to say an act ought to be done in the first and third senses of 'ought' which he points out is to say that it is fitting. 'Good' then means "fitting object of a pro attitude." Ewing attempts by use of this definition to reconcile the positions of Ross and Moore. He also claims that *prima facie* duties have a kind of coherence such that they tend to reinforce one another.

In my evaluation I reject Moore's attempts to define 'right' and 'ought' in terms of 'good' and also Ewing's attempt to define 'good' in terms of 'fittingness.' I also believe that these philosophers are right in claiming that naturalistic and metaphysical definitions of ethical terms must be false, and that both 'right' and 'ought' are indefinable in their basic senses. The basic sense of 'ought' I take to be that of moral obligation which is Ewing's second sense of 'ought.' The basic sense of 'right' I take to be Ross' first sense which is the rightness which an act has if it is fitting to the objective circumstances of the particular situation.

In general I agree with the claims of Ross and Ewing that we can intuitively discern *prima facie* rightness and obligatoriness. I also believe that Christian ethical principles are of great importance in considering *prima facie* duties.

Ross claims that one is not morally obligated to do a given act from a certain motive. Ewing contends that motives may sometimes be morally right and morally wrong. I believe that Ewing is right that motives are involved in moral obligation. Ordinary moral experience is more complex than is ordinarily indicated in ethical discussion and that our most important duties relate to attitudes.

201 pages. \$2.51. MicA 55-2176

### SCEPTICISM AND THE PROOF OF AN EXTERNAL WORLD

(Publication No. 13,008)

Elizabeth Hankins Wolgast, Ph.D.  
University of Washington, 1955

This work treats the traditional problem of "scepticism with regard to the senses." It takes issue with that view by the following method: (a) specific and detailed treatments of the arguments purporting to prove scepticism; (b) comparison of the general results of these arguments, allowing a fair characterization of the view; (c) confuting those general results by showing that they are incapable of expression in the frame-work of language.

The result of this work is principally this: that the

sceptical arguments on the one hand, and the sceptical view on the other, are both finally question-begging. In order to raise the issue it would be necessary to do so outside the context to which both the arguments and the view are

pertinent. There is, accordingly, no proper "question of scepticism" as philosophers have traditionally believed.  
189 pages. \$2.36. MicA 55-2177

## PHYSICS

## PHYSICS, GENERAL

## THE PROPAGATION OF STRAIN WAVES IN LEAD

(Publication No. 13,033)

Bruno Erich Kurt Alter, Jr., Ph.D.  
Lehigh University, 1955

Measurements of compressive strain pulses traveling in lead rods have been carried out. The apparatus used consists essentially of three long steel bars of equal length, two of which are held fixed with a specimen rod mounted coaxially between them. The third rod, which is suspended horizontally, is allowed to impact the end of one of the fixed rods and thereby cause a compressive pulse to be sent down the rod and into the specimen. The propagation of the resulting strain in the lead rod is observed by means of circumferentially wound resistance strain gauges which produce permanent records of strain with time on a strip of film in a rotating drum chronograph. The unique features of the apparatus relate to its geometry. The bar lengths are such that no unloading wave is present during the time of observation of the strain pulse. Use of a stepped impact bar permits the specimen to be dynamically prestressed in compression.

The records obtained, particularly with the stepped impact bar, show that a plastic wave theory (von Kármán theory) neglecting rate of strain effect cannot account for the propagation of strain in lead. However, a simple model of a metal exhibiting a rate of strain effect does predict all of the essential features of the experimental observations. 121 pages. \$1.51. MicA 55-2178

## THE THERMAL AND ELECTRICAL CONDUCTIVITIES OF LEAD-BISMUTH ALLOYS

(Publication No. 13,036)

Joseph Michael Clifford, Ph.D.  
Lehigh University, 1955

The results are presented of measurements made of the thermal conductivity and electrical resistivity of four bismuth specimens containing small amounts of lead. Also presented is an analysis of the Forbes-bar method for measuring the thermal conductivity of metals.

The addition of small amounts of lead greatly increases the electrical resistivity of bismuth [Alfred B. Focke and John R. Hill, *Phys. Rev.*, 50, 179, (1936); N. Thompson, *Proc. Roy. Soc. A*, 155, 111, (1936)]. The thermal conductivity and electrical resistivity of four bismuth

specimens (containing nominally 0%, 0.85%, 1.5%, and 3.0% of lead) were measured as a function of temperature from room temperature to 100°C. Although the room-temperature electrical resistivities were respectively 136, 229, 292, and 354 micro-ohm cm, the thermal conductivities of the four specimens were essentially the same, approximately 0.085 watt/cm C°.

The experimental method used, an adaptation of the Forbes-bar method, was that of Hogan and Sawyer [C. L. Hogan and R. B. Sawyer, *J. Appl. Phys.*, 23, 77, (1952)]. It measures the conductivity of a specimen from the results of two experiments: a measurement of the power required to maintain the specimen at a uniform temperature above that of the copper tube which forms the inner lining of the furnace, and a measurement of the temperature difference (as a function of distance along the specimen) between the specimen and the copper tube when one end of the specimen is heated. The first experiment measures the thermal conductivity of the insulating material which is packed between the specimen and the copper tube while the second experiment compares the conductivity of the specimen with that of the insulation.

The formal axially symmetric solution is obtained for Laplace's equation in cylindrical coordinates with two concentric media. A special case, which describes the temperature in the specimen ( $T_m$ ) and in the surrounding insulation ( $T_i$ ) during the second experiment, is

$$\begin{aligned} \nabla^2 T_m &= 0, & 0 \leq z \leq \infty, & 0 \leq r < a; \\ \nabla^2 T_i &= 0, & 0 \leq z \leq \infty, & a < r \leq b; \\ T_m(a, z) &= T_i(a, z); \\ k_m \partial T_m(a, z) / \partial r &= k_i \partial T_i(a, z) / \partial r; \\ T_m(r, \infty) &= T_i(r, \infty) = 0. \end{aligned}$$

The solution to the special case leads to an improved method of calculation which eliminates a systematic error caused by the inexact assumption that the details of heat transfer away from the specimen were identical in the two experiments of the method of Hogan and Sawyer. The remaining part of the general solution may be used as correction terms, to compensate for non-uniformity of the temperature of the copper tube within which are the specimen and its surrounding insulation.

82 pages. \$1.03. MicA 55-2179



# THE COMPRESSIBILITY OF AND THE HEAT TRANSFER IN HELIUM II

(Publication No. 12,724)

Harold Forstat, Ph.D.  
The University of Connecticut, 1955

An experimental investigation was made of the thermomechanical effect of the heat transfer of helium II in a column of packed jeweller's rouge in a closed system. The aims of this study were to obtain answers to the following questions:

1. Is it possible to obtain the full fountain effect pressure in a column of rouge?
2. Is it possible to make a measurement on the compressibility of helium II by using the fountain effect pressure?
3. Is there a connection between the heat transport property and the fountain effect pressure?
4. How do the experimental values for heat transfer compare with the values calculated from the linear theory of heat transfer, based on the internal convection process?
5. Is there a point of maximum heat transfer below the  $\lambda$ -temperature, if the heat transfer is examined as a function of temperature?

These questions formed the basis for the present study and this thesis describes the efforts employed in obtaining the answers.

The following are the results of the present investigation. By using a column of packed rouge which provided approximately  $10^8$  channels with an average channel size of 0.25 microns, and allowing a heat current to pass through it, a measurement of the compressibility of the liquid was made, yielding an average compressibility value of  $10 \times 10^{-3} \text{ atm}^{-1}$ . This value was obtained by assuming the operation of the full fountain effect, and is in good agreement with the values obtained by the usual methods. This indicates that the full fountain effect pressure is operating in the rouge column. In examining the heat transport property, measurements were made of the temperature differences across the rouge column, and then by employing the full fountain effect pressure, the heat transfer results were calculated on the basis of the linear theory. These results were compared with the experimental power inputs and gave good agreement at temperatures not too close to the  $\lambda$ -point. Thus it is shown that the heat transfer and fountain effect pressure in helium II are closely related and that this gives additional confirmation for the reliability of the compressibility measurements. Lastly, some evidence was obtained for an estimation of the location of a maximum in the heat transfer property below the  $\lambda$ -point and this location is estimated as 1 to 2 millidegrees below the  $\lambda$ -point.

82 pages. \$1.03. MicA 55-2180

# A METHOD FOR THE REDUCTION OF THE DOPPLER WIDTH OF MICROWAVE SPECTRAL LINES

(Publication No. 13,757)

Robert Horton Romer, Ph.D.  
Princeton University, 1955

A method is described for obtaining microwave molecular resonance lines which have widths substantially narrower than the usual Doppler width. The method has been tested on the  $J = K = 3$  inversion transition in ammonia, the transition frequency being about 24,000 megacycles/sec., corresponding to a radiation wave length of 1.25 cm. The normal Doppler width of the transition at room temperature is approximately 75 kilocycles/sec. (full width at half maximum amplitude). In this work, lines approximately 18 kc./sec. wide have been observed, approximately one fourth the normal Doppler width. Further narrowing by another factor of four by this method appears feasible.

For experimental reasons, instead of observing the power absorbed by the gas, the gas was excited by short microwave frequency pulses into "super-radiant" states, from which the gas radiates spontaneously in a coherent manner, and this spontaneous radiation was observed.

The line narrowing depends on the properties of the gas when contained in a resonant cavity in the form of a pancake: two large flat plates separated by a distance of approximately  $\lambda/2$ , where  $\lambda$  is the free space wave length of the transition being observed. The effect of wall collisions is to prevent molecules with a high component of velocity perpendicular to the plates from radiating for long times, and the usual Doppler effect is not present. The line shape depends on the collisions of molecules with the walls.

The cavity is operated at a low pressure so that collisions between molecules do not broaden the line. If the diameter of the two plates is very large, the line shape becomes very sharply peaked and in fact would have a singularity at the center, if no other broadening mechanisms were present, and if the diameter of the plates were infinite. For a cavity of finite diameter, a numerical calculation is required.

The cavity used had a diameter of 5.75 cm. and a height of approximately  $\lambda/2 = 0.625$  cm. The numerical calculation predicts a line 16.2 kc./sec. wide. Observed lines are 18 kc./sec. wide. The calculated and observed lines are nearly Lorentzian in shape. For a much larger diameter to height ratio, the calculated line shape becomes far from Lorentzian, having fairly high "wings," but a sharper center than a Lorentz line of the same width at half maximum amplitude.

The method has possible applications as a simple high resolution spectrometer or in frequency stabilization systems.

203 pages. \$2.54. MicA 55-2181

**THE CALCULATION OF THERMODYNAMIC FUNCTIONS  
FOR ASYMMETRIC ROTATOR MOLECULES  
AND OTHER POLYATOMIC MOLECULES**

(Publication No. 12,669)

Harold William Woolley, Ph.D.  
University of Michigan, 1955

The purpose of this study is to investigate and develop methods of calculation of the ideal gas thermodynamic properties for gases composed of polyatomic molecules. For a considerable period of time, methods have been available for making such calculations with an accuracy consistent with the use of the customary spectroscopic constants for the approximate representation of the quantized energy states of the molecule. It is to be expected that increased accuracy of numerical values for molecular energy levels and the determination of the energies of higher levels will be accompanied by an increasing use of higher order spectroscopic constants. Under this circumstance, there is a need for more complete approximate formulas for use in calculating the thermodynamic functions. Until recently, the approximation formulas which have been available for such calculations for polyatomic molecules have not included details of the low temperature effects arising from the finite size of the spacing of the rotational levels. An effort has been made to obtain useful approximations for these effects, suitable from low to high temperatures.

In Part I of this study, a survey of the problem is given, with an indication of available methods for calculating thermodynamic functions according to the principles of statistical mechanics. It includes a review of the use of the partition function for this purpose and touches on the methods available for its formulation and evaluation, including a brief outline of the Wigner-Kirkwood method for estimating quantum effects in almost classical systems.

In Part II, a treatment is presented for low temperature effects related to the rotational levels for a rigid asymmetric rotator. These effects appear as if of two kinds, with one arising from the general finite spacing of the low lying rotational levels, while the other is related to the existence of distinct symmetry classes among the rotational levels for asymmetric top molecules with structural symmetry. The first of these effects has been treated by Stripp and Kirkwood, who obtained two correction terms in inverse powers of the temperature. Using a completely different method, their two terms are verified and an indication as to the next higher order correction term is obtained. The method also gives an indication of the low temperature effects due to the existence of distinct symmetry classes for the rotational levels. Comparison with a result derived for the symmetric rotator gives a functional form for this effect, showing rapid decrease with rising temperature.

In Part III of the study, a short account of the theory of the determination of the energy levels for the general molecule is given, including an extension of the Wilson approximation for centrifugal stretching and distortion. The principal subject is the calculation of contributions to the thermodynamic functions due to various spectroscopic constants, including those pertaining to rotational-vibrational interaction, anharmonicity, and to azimuthal effects for doubly degenerate vibrations in linear and axially symmetric molecules. A systematic summation process treats

terms of arbitrary order of approximation. In addition to the inclusion of higher order constants, higher powers of the lower order spectroscopic constants are also treated. The departure from the harmonic oscillator - rigid rotator approximation is indicated also by means of a series in powers of the temperature.

The treatment as a whole provides usable procedures and formulas for the accurate calculation of thermodynamic functions for simple molecules for an extensive range of temperature from rather low temperatures to rather high temperatures. 200 pages. \$2.50. MicA 55-2182

**PHYSICS, NUCLEAR**

**THE MEAN FREE PATH FOR SHOWER PRODUCTION  
BY HIGH ENERGY PI-MESONS**

(Publication No. 12,688)

Fritz Edgar Froehlich, Ph.D.  
Syracuse University, 1955

In order to investigate a possible difference in the mean free paths for shower production by protons and by pi-mesons of very high energy, an experiment was carried out at Echo Lake, Colorado (altitude 3,260 m) in which the rate of production of penetrating showers by the atmospheric N-component was studied as a function of the absorber thickness up to a total of 650 g/cm<sup>2</sup> Pb, or about four proton mean free paths. A difference in the cross sections would then result in the "filtering out" of the component with the shorter mean free path, and manifest itself in an attenuation curve which is the superposition of two exponentials rather than a single exponential curve. By splitting the top absorber into three sections and using three top trays instead of the usual one, with the rigid condition that only a single counter in each tray be discharged, losses due to the complete absorption of all secondaries of an interaction occurring in the top absorber were minimized. The rate of interactions in the top absorber which still escaped detection could then be estimated from the results of the runs with smaller absorber thicknesses in which the lead absorber was distributed in various ways between and above the trays. Three further counter trays, placed in a lead pile, were used to select five types of showers of different multiplicity. The average energy of the primaries of these events were estimated to be about 5.3 Bev. ("low-energy group"), 8.3 Bev. ("medium-energy group") and 16-20 Bev. ("high-energy group"). Even after correcting for spurious events, the rates of the two latter groups - for which a substantial pi-meson component can be expected - do not fit a straight line on a semi-logarithmic plot. This indicates that the mean free paths of the two major components of the N-radiation are not identical. Under the assumption of equal detection probability for the interactions of both types of primaries, the mean free path for shower production by pi-mesons of both energy groups is found to exceed 320 g/cm<sup>2</sup>. It must be stressed that these results should not be interpreted as a proof for an interaction cross section smaller than the geometric nuclear cross section, but rather as an indication



that in collisions of very energetic pi-mesons, the number of pi-meson secondaries emitted differs from that resulting from proton collisions, perhaps because of a larger probability for the production of other secondary particles.

97 pages. \$1.21. MicA 55-2183

THE VELOCITY SPECTRUM OF  
COSMIC RAY PARTICLES AT  
THIRTEEN GRAMS ATMOSPHERIC DEPTH

(Publication No. 13,339)

Earl Nelson Mitchell, Ph.D.  
University of Minnesota, 1955

Two balloon flights have been made at geomagnetic latitude of 55 degrees carrying a Cerenkov detector whose mean pulse height is velocity dependent and is thus capable of providing an independent check on the velocity spectrum at this latitude. The Cerenkov detector was operated in coincidence with a Geiger counter telescope on both flights, and the detector was surrounded by a ring of guard counters on the second flight. An experimental measurement of the dependence of the pulse height distribution on velocity for this detector made in the  $\pi^-$  beam of the Chicago cyclotron has been used to calibrate this detector. It was found that the detector performed approximately, but not entirely, as Cerenkov theory predicts. On the first flight, data was gathered which made it possible to examine the variation of the shape and position of the pulse height distribution with altitude. From this study, qualitative information was obtained concerning the nature of the transition of the primary flux as it passes down through the atmosphere. On the second flight data was collected at thirteen millibars which gave quantitative information on the primary flux and the total flux at that altitude. A velocity spectrum was obtained which indicated that two-thirds of the particles at thirteen grams must be attributed to secondaries or primaries other than protons if the assumptions of the geomagnetic theory are to be maintained. Using the geomagnetic theory, a primary proton flux value of  $0.11/\text{cm}^2\text{-ster-sec}$  and primary alpha flux of  $0.025/\text{cm}^2\text{-ster-sec}$  was obtained.

70 pages. \$1.00. MicA 55-2184

GENERALIZED QUANTUM ELECTRODYNAMICS  
— A COVARIANT FORMULATION

(Publication No. 12,940)

George R. Pitman, Jr., Ph.D.  
University of Cincinnati, 1955

The older forms of quantum electrodynamics possess a number of difficulties when applied to problems which involve the interaction of the electromagnetic field and the electron-positron field. These difficulties manifest themselves in the occurrence of divergencies when certain calculations are carried out such as in the self energy problem and the determination of the vacuum polarization current. In our opinion these difficulties can be traced to

the fact that the Maxwell-Lorentz electrodynamics inherently contains a  $1/r$  singularity. In the nonquantum case this difficulty has been overcome by Podolsky and Bopp in the formulation of the generalized electrodynamics.

It is our purpose in this dissertation to formulate the generalized quantum electrodynamics in a covariant fashion using the techniques developed by Schwinger. The essential features of the generalized electrodynamics are: first, the  $1/r$  singularity is removed and second, the electromagnetic field can be decomposed into two fields which represent the ordinary electromagnetic field and an auxiliary field composed of photons which possess mass. One of the difficulties of the theory as previously developed is that when this auxiliary field is quantized its energy eigenvalues are negative. This difficulty can be traced to the auxiliary conditions employed. One contribution of this thesis is the discovery of an auxiliary condition which does not make the energy eigenvalues of this field necessarily negative. This is achieved by applying the usual Lorentz condition to the ordinary field alone so that the energy eigenvalues of this field are positive, while the auxiliary condition on the extraordinary field is relaxed thus not fixing the sign of the energy eigenvalues of this field.

The invariance of the commutation rules was achieved by generalizing Schwinger's work to apply to the extraordinary field. The commutation rules were first formulated to hold on any time-like hypersurface and later this restriction was removed through the introduction of a class of invariant functions so that the commutation rules hold in any Lorentz frame.

Next the theory was formulated in the interaction representation so that the effects of the interaction between the electromagnetic field and the matter field could be studied separately. Following Schwinger the equation of motion in this representation was developed to give the temporal development of the system in an invariant fashion. The field equations in this representation are the usual homogeneous field equations. As a consequence of this study it was found that the effects of the interaction of the ordinary and extraordinary fields with the matter field can be treated independently.

Finally, the vacuum state for the extraordinary field was defined. This was complicated by the fact that there is no auxiliary condition imposed on this field. In the usual treatment of quantum electrodynamics the auxiliary condition can be interpreted as eliminating the longitudinal components of the electromagnetic field vector thus leaving the transverse part as the only physically meaningful part. Thus in Schwinger's work the definition of the vacuum for the electromagnetic field only involves the positive frequency part of the transverse component since its energy eigenvalues are positive. However, for the extraordinary field the longitudinal component is still present and hence is involved in the definition of the vacuum. Since the space-like components of the extraordinary field vector have negative energy eigenvalues we have developed the definition of the vacuum for these components in terms of their negative frequency components, whereas since the time-like component has positive energy eigenvalues the definition of the vacuum for this component has been developed in terms of the positive frequency components.

59 pages. \$1.00. MicA 55-2185

# THE DIRECTIONAL CORRELATION OF SUCCESSIVE GAMMA RAYS FROM $\text{Sn}^{116}$ AND $\text{Ge}^{72}$

(Publication No. 12,641)

Rolf Paul Scharenberg, Ph.D.  
University of Michigan, 1955

The determination of the spins and life-times of the short lived isomeric states of nuclei will allow an identification of either single particle or collective nuclear transitions. The spins of the higher excited states are of particular interest. The measurement of the directional correlation of successive gamma rays can in favorable instances uniquely assign spins to these states, and determine the multipole order of the associated gamma radiation. The directional correlation of successive nuclear radiation is especially sensitive to possible mixed transitions. Measurement of the mixing ratio of multipole transitions gives further information about the nuclear wave function. Because the higher energy states occur as part of a complex gamma spectrum a fast coincidence gamma spectrometer was designed, (resolving time 8 millimicro seconds). This allows effective selection of the various gamma-gamma cascades. In this thesis the directional correlation of successive gamma rays from  $\text{Sn}^{116}$  and  $\text{Ge}^{72}$  were measured.

The theoretical directional correlation functions are determined by the angular momentum of the nuclear states, and the angular momentum carried off by the emitted gamma rays.  $J_0(L_1)J_1(L_2)J_2$  is the description of a double cascade. If a mixture of two multipole orders occurs in one transition  $L_1, L_1'$  then the description of the double cascade is given by:  $J_0(L_1, L_1', \text{phase}) J_1(L_2)J_2$ .

$\text{Sn}^{116}$  decays via 1.09 Mev. - 1.27 Mev., 1.48 Mev. - 1.27 Mev., 0.40 Mev. - 2.09 Mev. gamma cascades following beta decay from 54 Minute  $\text{In}^{116m}$ . The directional correlation of these cascades are in agreement with  $4(2)2(2)0$ ,  $4(2)2(2)0$ ,  $2(98\%, 2, 2\%, 1, 0^\circ \text{ phase}) 2(2)0$  correlation functions respectively. The following spin assignments were made: Ground state spin 0 (even-even nucleus); 1.27 Mev. level spin 2; 2.09 Mev. level spin 2; 2.32 Mev. level spin 4; 2.49 Mev. level spin 2; 2.74 Mev. level spin 4. The 1.09 Mev., 1.27 Mev., 1.48 Mev., 2.09 Mev. gamma rays are identified as quadrupole. The 0.40 Mev. gamma ray is 98% quadrupole and 2% dipole.

$\text{Ge}^{72}$  decays via a complex gamma spectrum following beta decay from 14 hour  $\text{Ga}^{72}$ . The existence of the 2.5 Mev. - .82 Mev. cascade was verified by the scintillation sum spectrum. The directional correlation of this cascade is in agreement with a  $5(3)2(2)0$  correlation function. This assigns spin 5 to the 3.34 Mev. level, and spin 2 to the .82 Mev. level. The 2.5 Mev. gamma ray is identified as octupole. The .82 gamma ray is identified as quadrupole.

63 pages. \$1.00. MicA 55-2186

# ANGULAR CORRELATION OF THE GAMMA-RAYS OF CESIUM 134

(Publication No. 12,651)

Melbourne George Stewart, Ph.D.  
University of Michigan, 1955

One of the main problems of low energy physics is the determination of the properties of nuclear energy levels. It has been known for a number of years that successive gamma rays emitted by a nucleus will be correlated in their relative propagation directions. The measurement of this directional or angular correlation provides a means for assigning the angular momenta of the nuclear levels involved and the character of the emitted radiation. The correlation function is measured experimentally by observing the coincidences per unit time as a function of the angle between the detectors.

A fast coincidence spectrometer with a resolving time of eight milli-microseconds was developed in order to study the angular correlations of complex decay schemes. The coincidence spectrometer consisted of two fast channels which were in parallel with slower energy selection channels. The fast coincidence output was placed in triple coincidence with the two energy selection outputs in order to select a particular coincidence. The resolving time of the triple coincidence circuit was 200 milli-microseconds.

The angular correlations of the gamma rays following the beta decay of the 2.3 year isomer of cesium-134 were measured. It was possible to make a unique assignment of the spins of three excited states of barium-134 and the multipole order of the four main gamma rays.

The overall angular correlation was measured using both a solid and a liquid source. The solid source was  $\text{Ca}_2\text{CO}_3$  and the liquid source was  $\text{Ca}_2\text{CO}_3$  dissolved in water. The identical results of these measurements indicate there are no perturbations of the nucleus while it is in the intermediate states. The results of the overall correlation are in agreement with those of the previous investigators.

The angular correlation of the 0.797 Mev and the 0.605 Mev gamma rays is in very good agreement with a basic quadrupole-quadrupole correlation. The ground state of barium-134 is assumed to have a spin of 0 since it is an even-even nucleus (56 protons - 78 neutrons). This assignment then requires spins of 2 and 4 for the first and second excited states respectively with both radiations quadrupole.

A spin assignment of 3, 4, or 5 for the 1.97 Mev level would be consistent with the results of beta decay measurements. The angular correlation of the 1.367 Mev and the 0.605 Mev gamma rays is in agreement with a basic quadrupole-quadrupole correlation but is not in agreement with either a basic octupole-quadrupole correlation or a basic dipole-quadrupole correlation. Since the ground state and first excited state have spins of 0 and 2 respectively, the 1.97 Mev level must therefore have a spin of 4. The 1.367 Mev transition is quadrupole radiation.

The triple angular correlation of the 0.567 Mev, the 0.797 Mev, and the 0.605 Mev gamma rays was observed at three positions:  $\omega(90^\circ, 90^\circ, 90^\circ)$ ,  $\omega(120^\circ, 240^\circ, 0^\circ)$ , and  $\omega(90^\circ, 180^\circ, 0^\circ)$ . The measurements are not in agreement with an assignment  $4(L_0)4(Q)2(Q)0$  with  $L_0$  either pure dipole or pure quadrupole radiation. Thus it is concluded



that the 0.567 Mev gamma ray is not a pure multipole but is a mixture of dipole and quadrupole radiation.

The one-three angular correlation of the 0.567 Mev and the 0.605 Mev gamma rays is consistent with an assignment  $4(D,Q)4(Q)2(Q)0$ . The upper transition is a mixture of 97 percent quadrupole and 3 percent dipole radiation with a  $0^\circ$  phase difference between the nuclear matrix elements. 68 pages. \$1.00. MicA 55-2187

## PHYSICS, SPECTROSCOPY

### MOLECULAR SPECTRA OF THE PENTAFLUORIDES OF ANTIMONY, ARSENIC, AND BROMINE

(Publication No. 12,965)

Lawrence Keith Akers, Ph.D.  
Vanderbilt University, 1955

Supervisor: Dr. Ernest A. Jones

The corrosive nature of the pentafluorides of antimony, arsenic, and bromine makes it difficult to prepare pure samples of these compounds and prevents the use of materials normally utilized in molecular spectroscopy. The Raman studies of these compounds is made possible by the use of the plastic poly-fluorotrchloroethylene, which does not react with them. The infrared spectra were obtained using cells of fluorinated monel, fluorinated brass, and the inert plastic poly-tetrafluoroethylene. Several different window materials were used in order to obtain spectra without interference of window bands. The window bands are caused by the reaction of the pentafluorides with the window materials and cause certain regions of the spectra to appear opaque to the infrared light.

A Perkin-Elmer Model 21 Infrared Spectrometer was used to obtain the infrared spectra from 2 to 25 microns with NaCl optics being used from 2 to 15 microns and KBr optics being used from 15 to 25 microns. The Raman spectra were recorded with a Hilger E612 Spectrograph on Eastman spectrographic plates of the following types: 103a-O, 103a-J, 11a-O, and 11a-J. The Raman source consisted of 8 General Electric AH-2 mercury lamps arranged symmetrically around the Raman tube.

Commerically available samples of  $SbF_5$  and  $BrF_5$  were

purified by fractional distillation. Pure samples of these two compounds were sealed off in their Raman tubes under their own vapor pressures at room temperature to maintain their purity.

The  $AsF_5$  was prepared by passing fluorine over arsenic in a copper apparatus and purifying the collected sample. A molecular weight determination was made by weighing the gas in a container of known volume at known pressures and temperatures. The molecular weight obtained in this way agreed with the theoretical molecular weight of  $AsF_5$  within the experimental error which was less than 3 percent. A mass cracking pattern of some of the unpurified  $AsF_5$  was obtained on a mass spectrometer, indicating impurities totalling about 7 percent by weight. These impurities had already been identified from their infrared spectra and were removed during purification.

Because of the low boiling point of  $AsF_5$  ( $-53.2^\circ C.$ ) a special technique was employed in obtaining its Raman spectrum. The Raman tube was centered inside a specially constructed unsilvered glass Dewar. Dry nitrogen was cooled by successive baths of a dry ice-trichloroethylene mixture and liquid oxygen and blown around the Raman tube. By controlling the rate of flow of the nitrogen, the  $AsF_5$  could be kept below its boiling point.

From the observed vibrational fundamental frequencies,  $BrF_5$  was assigned to a  $C_{4v}$  structure which is a tetragonal pyramid with four fluorine atoms forming the square base, one fluorine atom at the apex, and the bromine atom at the center of mass. Using this structural assignment, a vibrational analysis was made on the observed spectra.

From its observed vibrational fundamental frequencies,  $AsF_5$  was assigned to a  $D_{3h}$  structure which is a trigonal bipyramid with three of the fluorine atoms forming the equilateral triangle common base, one fluorine atom at each pyramid apex, and the arsenic atom at the center of mass. A vibrational analysis was also made on the observed spectra of  $AsF_5$ .

Force constants were calculated for  $AsF_5$  using a general quadratic potential function with two added terms to account for the repulsive forces between the fluorine atoms. Thermodynamic functions were also calculated for  $AsF_5$  at various temperatures using the harmonic oscillator, rigid rotator approximation for the gas at one atmosphere pressure.

The experimental results obtained here could be extended by obtaining more complete spectral data on  $SbF_5$  and by extending the infrared region of observation for all three pentafluorides to longer wavelengths.

110 pages. \$1.38. MicA 55-2188

## PHYSIOLOGY

### THE EFFECT OF DIFFERENT PLANES OF NUTRITION AND FREQUENCIES OF COLLECTION ON BOVINE SEMEN PRODUCTION

(Publication No. 13,328)

Edmund Fay Graham, Ph.D.  
University of Minnesota, 1955

Adviser: W. E. Petersen

Two sets of monozygotic triplet grade Guernsey bulls were used in the experiment. One member of each set of monozygotic bulls was fed 70 per cent, 100 per cent, and 130 per cent levels of total digestible nutrient intake as recommended by Morrison's standard for feeding mature bulls in heavy service.

For part of the experimental period (44 weeks) semen from all animals was collected once per week (two ejaculates). For part of the experimental period semen was collected from one set twice weekly (four ejaculates) for a 44 week period and twice weekly (four ejaculates) from the other set for 27 weeks.

During the experiment one bull receiving 100 per cent of his nutrient requirement died. His respective mates, one receiving 70 per cent and one 130 per cent of their nutrient requirements were reversed, as to nutrient intake, for a 30 week period.

Due to the fact that all bulls were of grade stock few animals were bred with the semen collected, therefore no fertility data were collected. The quantity and quality of all semen samples was measured by volume (ml.) concentration of spermatozoa per ml., total number of spermatozoa produced per ejaculate, total number of spermatozoa produced per week, progressive motility, percentage of live spermatozoa, percentage of abnormal spermatozoa and methylene blue reduction time. The difference in libido of the bulls on different planes of nutrition and frequencies of collection was ascertained by measuring the time in minutes to collect two ejaculates.

Varying levels of nutrient intake were effective in altering the semen producing ability and semen quality as well as maintaining the bulls at different weights and degrees of skeletal growth. There was found a highly significant difference between bulls on the different planes of nutrition with the bulls on the high plane (130 per cent) yielding greater quantities of semen of higher quality than either the bulls on the normal plane (100 per cent) or low plane (70 per cent). The bulls on the normal plane (100 per cent) were intermediate to the high and low bulls. Below normal feeding (70 per cent) decreased volume and quality of semen produced.

A highly significantly longer time was required to collect semen from the bulls on the higher planes of nutrition than from the bulls on the below normal feeding.

Increasing the frequency of collection from two ejaculates per week to four ejaculates per week decreased the volume of semen and total number of spermatozoa

produced per ejaculate but the total volume and total number of spermatozoa were increased per unit time. The increase in frequency of collection did not significantly alter the number of spermatozoa produced per ml. The higher frequency of collection lowered the quality of semen produced but not to the extent that it would be considered poor quality semen by most standards. Significantly less time was required to collect two ejaculates of semen from the bulls when they were placed on the higher frequency of collection. There was, however, a significant interaction between planes of nutrition and frequencies of collection, indicating that bulls on the higher planes of nutrition decreased in time required to collect two ejaculates of semen whereas the bulls on the low plane of nutrition required more time when on the higher frequency of collection.

By reversing the rations of the "low" and "high" bulls of one set it was found that the bull that was fed above normal after being underfed increased rapidly in body weight and increased in ability to produce larger quantities of semen and total number of spermatozoa.

148 pages. \$1.85. MicA 55-2189

### THE INFLUENCE OF THE SYMPATHETIC-ADRENOMEDULLARY SYSTEM ON THE RESPONSE TO OXYGEN AT HIGH PRESSURE

(Publication No. 12,594)

Paul Christian Johnson, Ph.D.  
University of Michigan, 1955

It has previously been shown that the pituitary-adrenal defense system is active and exerts a harmful effect in oxygen at high pressure (OHP). Since there are a number of indications of sympathetic activity in OHP, the experiments described here were designed to expand the data on this point and to determine in what respects the activity of this defense system affects the response to oxygen at high pressure.

In all the experiments, Sprague-Dawley rats were exposed to oxygen at 80 to 90 lbs. pressure with CO<sub>2</sub> continuously removed except where specified. In most cases exposure continued until seizures were produced, at which time the animals were slowly decompressed. When determining the effects of various drugs upon the response to OHP, survivors were sacrificed and the lungs were examined for damage. The time of onset and severity of seizure, the mortality rate, and the incidence of lung damage were all recorded.

In the first series of experiments, the blood sugar level before and after OHP was measured as an index of sympathetic activity. It was found that the blood sugar level was elevated after exposure to OHP; and much larger increases were seen after oxygen seizure. Since the increases in



blood sugar were not seen after adrenalectomy, it was concluded that they were at least partially due to excitation of the sympathetic nervous system.

To determine the effects of this activity on the response to OHP, a second series of experiments was performed using the sympathomimetic agent, epinephrine. It was found that epinephrine hastened the onset of seizures and augmented their severity, while increasing lung damage and mortality. Injections of epinephrine into adrenalectomized animals had the same effect, indicating that part of the benefit of adrenalectomy in OHP is due to removal of the adrenal medulla.

Injections of the sympathetic excitant, insulin, had a similar potentiating effect in OHP. Also, the addition of 40 to 80 mm CO<sub>2</sub>, which excites the sympathetics, enhanced lung damage as well as other O<sub>2</sub> effects.

These experiments, dealing with the effects of sympathetic activity, demonstrate that it is deleterious in OHP. Further experiments, employing sympatholytic agents, indicated that blockage of sympathetic activity is helpful in OHP. Dibenamine had some small protective effect against lung damage, while tetraethylammonium (TEA) reduced both seizures and lung damage to a significant degree. The sympatholytic agent N-(9 fluorenyl)-N-ethyl beta chlorethylamine (SKF 501) reduced seizure intensity and provided almost complete protection against mortality and lung damage. These results indicate that lung damage, and perhaps mortality, are largely a consequence of sympathetic activity.

Further experiments disclosed that SKF 501 provided almost complete protection against lung damage in OHP + CO<sub>2</sub>, indicating that the effect of CO<sub>2</sub> in enhancing lung damage is mainly attributable to its effects on the sympathetic nervous system. This evidence indicates that lung pathology in OHP is "neurogenic."

The explanation of the potentiation of oxygen seizures by the sympathetics may lie in the fact that epinephrine has an excitatory action on the hypothalamus and the reticular formation of the diencephalon, both of which may contribute to seizures of sub-cortical origin.

These results demonstrate: 1) that the sympathetic nervous system is active in OHP; 2) that this system contributes importantly to oxygen convulsions and mortality; and 3) that profuse activity of the sympathetic-adrenomedullary system may be the primary cause of lung damage in oxygen at high pressures.

112 pages. \$1.40. MicA 55-2190

#### ENDOCRINE FACTORS RELATED TO TOXICITY OF OXYGEN AT ATMOSPHERIC PRESSURE

(Publication No. 12,648)

Charles Welstead Smith, Ph.D.  
University of Michigan, 1955

Earlier work has established that pituitary, adrenal, and thyroid principles enhance adverse response to oxygen at high pressures. The purpose of this investigation was to determine the possible effects of these endocrine factors upon the adverse response to oxygen in high concentrations at atmospheric pressure (OAP).

Young Sprague Dawley rats, maintained on a uniform

diet, were chosen as experimental subjects. They were exposed to oxygen in especially constructed airtight chambers. Concentration of oxygen was, in general, maintained above 95 per cent by continuous flow of gas supplied from commercial cylinders. Carbon dioxide level was kept below 0.20 per cent by soda lime. Temperature was about 28°C.

In the first section, experiments were carried out to determine the effects of hypophysectomy upon rats exposed to oxygen at atmospheric pressure. It is well-known that animals continuously exposed to OAP for long periods exhibit gross pulmonary congestion, hyperemia, consolidation and massive hydrothorax. The extreme involvement is indicative of a major alteration of permeability in the vascular bed. Hypophysectomy was found to provide a very significant degree of protection from OAP adverse effects as indicated by lessened pulmonary pathology, decreased hydrothorax and increased survival time of the operated rats. The inference was made that this protection was attributable, in part at least, to elimination of adreno-corticotrophin and of adreno-cortical factors.

In carrying this investigation further, it was found that adrenalectomy also provided protection against OAP ill effects. This protection was evidenced by a decreased degree of pulmonary pathology, lessened hydrothorax and increased survival time of the operated rats. These experiments substantiated the inference that removal of adreno-cortical factors was responsible, at least, in part, for the protection from OAP effects conferred by hypophysectomy. The conclusion that removal of some adrenal principle imparted beneficial effects to rats in OAP was justified.

This conclusion was further supported by the results of experimental studies in which cortisone was administered to animals in OAP. This adreno-cortical factor significantly shortened survival time in oxygen and accentuated the typical pulmonary pathology.

Since adrenalectomy removes medullary as well as cortical hormones it is possible that part of the protection conferred by adrenalectomy might be due to removal of epinephrine. Experiments were undertaken, therefore, to determine what effect, if any, epinephrine would have upon animals exposed to OAP. Subcutaneous injection of epinephrine, in amounts too small to be injurious in air controls, brought about a significant enhancement of OAP adverse effects. This enhancement was evidenced by greatly decreased survival time and by accentuated lung pathology. The results of this study indicated that the medullary factor may act in mediating adverse response to OAP.

Part of the protection afforded by hypophysectomy might possibly be due to removal of thyrotrophin with consequent diminishment of thyroid secretion; therefore, studies were undertaken to determine the effect of thyroid factors upon the toxic response of rats to OAP. It was found that thyroid hormone when administered as dessicated thyroid or as thyroxine decreased survival time and enhanced lung pathology of normal rats in OAP. In addition, thyroid factors were found to reverse the beneficial effects of hypophysectomy; this also was shown by decreased survival time in oxygen and increased degree of lung damage. These data indicate that the beneficial effects of hypophysectomy may be due, in part, to decreased thyroid function.

While it must be recognized that the conditions of stress which are present in oxygen at high pressures and in oxygen at atmospheric pressures are not identical, the data obtained from this investigation demonstrate that the

endocrine factors which have been shown to be damaging in oxygen high pressure are also operative in enhancing the adverse effects of oxygen at atmospheric pressure.  
108 pages. \$1.35. MicA 55-2191

# CHOLINESTERASE STUDIES ON THREE ISOLATED CHOLINERGIC SYSTEMS

(Publication No. 12,672)

Lloyd Robert Yonce, Ph.D.  
University of Michigan, 1955

This study was instituted to determine the effect of a cholinesterase (Cutter Laboratory) on three cholinergic neuro-effector systems, the vago-cardiac system of *Chelydra serpentina*, the chorda tympani-submaxillary gland system of the dog, and the superior cervical ganglion of the cat.

The turtle auricle was excised with the vagus nerve intact and placed in a glass receptacle containing a physiological solution. Cholinesterase, placed in the ambient solution, decreased the inotropic and chronotropic inhibition if repetitive shock stimuli were applied to the vagus nerve. According to Langmuir's theory of heterogeneous reactions, the amount of inhibition would be a function of the area available to the liberated acetylcholine and of the concentration of the acetylcholine. The concentration of the acetylcholine would be constant if the stimulus to the vagus were constant. The area available at a constant stimulation will depend on the movement of the liberated acetylcholine. Beats of the auricle will actively force the liberated acetylcholine into larger areas. The effect of the beats was shown in four ways. 1. Information on after-discharge or related phenomena would not explain the gradual increase (10-25 seconds) of inhibition with a single shock stimulation. 2. Cholinesterase will not decrease the amount of inhibition caused by a single shock to the vagus. 3. When different ambient solutions were used, the amount of inhibition varied but the number of beats remained the same. 4. At the end of a repetitive stimulation which caused complete chronotropic inhibition, the auricle must

still progress through the phase of increasing inotropic inhibition before recovering. If beats occurred during the period of stimulation after cholinesterase had been applied, the phase of increasing inhibition at the end of stimulation is eliminated.

In the dog, all blood vessels of the common carotid artery except those to the submaxillary gland and all veins to the external jugular vein except those from the submaxillary gland were ligated. Cholinesterase, injected into the common carotid artery, caused less salivary flow and blood flow from the gland when the chorda tympani was stimulated.

In the cat, the isotonic contractions of the nictitating membrane were used as a criterion of the superior cervical ganglion activity when the preganglionic nerve was stimulated. Cholinesterase, applied topically or injected into the circulation, caused a decrease in the height of contraction, a greater decrease occurring at high frequency stimulation. The contraction of the nictitating membrane appears to be a function of the rate of liberation, the rate of hydrolysis, and the rate of synthesis of acetylcholine. High frequencies caused a liberation and destruction of acetylcholine more rapid than it could be resynthesized, thus causing a decline of the contraction height. The greater cholinesterase effect at high frequencies was probably the combined action of two effects, the increased rate of hydrolysis of the liberated acetylcholine and the decreased amount of liberated acetylcholine.

The reaction of each of the three effectors to repetitive nerve stimulation closely approximated the neurohumoral concept of temporal summation.

Four general conclusions may be drawn from this study.

1. Cholinesterase decreases the reaction of an effector organ to a repetitive cholinergic nerve stimulation.
2. The delay of maximum inhibition of the auricle when the vagus is stimulated with a single shock depends on the dispersion of the liberated acetylcholine by the beat of the auricle.
3. The reaction of the nictitating membrane to preganglionic stimulation depends on the rates of liberation, hydrolysis, and synthesis of acetylcholine in the superior cervical ganglion.
4. Temporal summation of each of the neuro-effector systems is in accord with the neurohumoral concept.

120 pages. \$1.50. MicA 55-2192



## POLITICAL SCIENCE

### POLITICAL SCIENCE, GENERAL

#### THE POLITICAL ORIENTATION OF THE PUBLIC SCHOOL AS REFLECTED IN THE EVOLUTION AND PRESENT STRUCTURE OF THE NEW YORK STATE PUBLIC SCHOOL SYSTEM

(Publication No. 12,694)

Harold Leonard Rakov, Ph.D.  
Syracuse University, 1955

This study of the development and present structure of the New York State public school system provides insight into the public school's orientation in our society. The public school concept which emerges emphasizes the "public" in public education, for attention is focused on its popular basis. That orientation appears essentially political.

A conceptual basis of the public school is developed from the evolution of the tax-supported, non-sectarian elementary and high schools which are the "cutting edge" of the New York State public school system. Included is the development of compulsory education. The first three phases of this evolution (c. 1621-1821) deals with important antecedental developments. The second phase (c. 1821-1900), marks the institutionalization of the public school as the basic unit of a state system of public elementary and secondary education. The adaptation and refinement that has occurred during the twentieth century constitutes the last of these phases.

The development of governmental and administrative context follows. Local and intermediate units of school government and their officials, and the state's participation in planning and financing school construction and teacher certification are treated in that order.

The New York State public school's political orientation is established in its existence as a governmental agency. Popular support and control are effected through governmental devices such as the ballot and taxation. Policies and operation are subject to the judgment of citizens. The public school is seen as political also in terms of the fundamental reasons for its existence. Developing the individual's capacities so that he may maintain his identity, and providing cohesive elements so that American democracy may maintain its identity, are fundamental purposes of the public school.

The tendency for management and administration to become increasingly professionalized is seen as moving the schools from their popular basis, and is viewed as constituting, in some respects, a denial of their political orientation. Since the optimum cultural contribution of the public school is assumed to require of its teachers and administrators a clear perception of the school's overall function and the fullest exploitation of means to accomplish its purposes, this tendency is viewed with misgiving, and the public school in the state appears to require more than the most astute application of educational "best practice" to achieve its aims.

A challenge to the exercise of a kind of statesmanship by teachers and administrators is found in this political orientation. The leadership implied should be, for practical reasons, concerned with developing and encouraging public understanding of and sympathy with the problems and goals of the school as a basis of consistent public support. Ideologically, there is need for encouragement of public participation in order that the public school teach through exemplification the basic principles and practices of democracy. Endorsement of this kind of leadership is found in the current wave of public school criticism. Recognition of criticism as a vital element in the democratic process, and the assessment of oppositional value judgments and their adaptation to school policies and activities are highlighted as requirements of successful leadership.

In view of this challenge, the preparation of public school teachers and administrators is presumed to need revision to accommodate courses and materials which will parallel the teacher's and administrator's orientation with that of the school. Support for this presumption is noted in revision taking place in colleges and universities, and in the findings of Cooperative Development of Public School Administration in New York State. The fields of Political Science and Public Administration are suggested as areas in which may be found certain of these courses and materials.

243 pages. \$3.04. MicA 55-2193

#### THE PHILIPPINE PRESIDENCY: AN EVALUATION IN TERMS OF AMERICAN PRACTICES AND PROCEDURES

(Publication No. 12,339)

John Henry Romani, Ph.D.  
University of Michigan, 1955

The purpose of this dissertation is to make an exploratory study of the Philippine Presidency from 1935 to 1954 in an attempt to evaluate the similarities and differences between it and the American Presidency after which the Philippine institution was patterned. In making the study, only the developments between 1935 and 1941, and 1945 and 1954 were examined. No attempt was made to consider the institution from 1942 to 1945, at which time the Philippines were occupied by Japanese forces and the normal functions of government suspended.

The introduction of the study is an historical analysis of Philippine executive institutions in existence before 1934 and the political events from 1900 to 1934 which have a bearing on the development of the presidential office. Attention is also given here to Filipino political thought as it relates to the problem of executive leadership. The main body of the study is divided into five chapters which treat separately the presidential selection process, the

executive power, the administrative power, the role of the President in foreign relations, the functions of the chief executive in policy formulation, and the relationship of President to the political party. In each instance, the examination is concerned with the debates at the 1934 Constitutional Convention, usages of the specific constitutional provisions involved, interpretations of the presidential role by the Philippine Presidents from 1935 to 1954, and a comparison with American practice where ever applicable. The final section is an evaluation of the President as the national leader and a summary statement of the preceding discussion.

Three primary and three secondary conclusions concerning the nature of the Philippine Presidency are presented in the final chapter. The first major conclusion is that the office created by the 1934 Constitutional Convention closely resembles the American Presidency in form and is the direct result of American influences operative in the Philippines. The second is that the dominant constitutional and legal role of the Philippine President is a reflection of traditional Filipino thought. The third is that presidential leadership in the Philippines is highly personal and partisan in nature. The three secondary conclusions are: one, since 1946, Congress and the Court have shown a marked tendency to resist presidential direction and to overcome their relatively inferior constitutional positions; two, the wide range of authority vested in the chief executive makes it possible for this official to govern without either the full support of the people or the other branches of government; and three, the Philippine political system requires, much more than the American system, that the Presidency be held at all times by an individual capable not only of assuming the large responsibilities inherent in the office but of providing dynamic leadership as well. 280 pages. \$3.50. Mic 55-285

#### INDIAN POLITICAL BEHAVIOR: A STUDY OF THE DEVELOPMENT OF A MULTI-PARTY SYSTEM

(Publication No. 13,197)

Myron Weiner, Ph.D.  
Princeton University, 1955

This thesis explores the factors involved in the development of a multi-party system in India. The study assumes that the kind of political party system which develops in India, and probably for that matter in any of the new democracies in Asia, will be a major factor in determining whether political stability and in turn, democratic institutions are maintained.

Since India achieved Independence in 1947, there has been a continuous fragmentation of political parties. As a result, 21 parties won seats in the Parliament and a larger number in the state legislatures. Why has this fragmentation occurred? Does this mean the permanent development of a multi-party system and if so, what are the implications of this for political stability and democracy in India? These are the central problems of the study.

The basic method has been to examine situations in which splits have occurred in political parties and in which mergers of parties have been attempted, successfully and otherwise. The study is divided into six cases. They are as follows:

- (a) the Congress Socialist Party split from Congress in 1948,
- (b) the split of a group of Gandhians from Congress in 1951 to form the Kisan Mazdoor Praja Party;
- (c) the successful merger of the Socialist Party and the KMPP in 1952,
- (d) the formation of Jan Sangh in 1951 by the Rashtriya Swayamsevak Sangh which broke years earlier from the Hindu Mahasabha.
- (e) the attempted but unsuccessful merger of Jan Sangh, the Hindu Mahasabha, and Ram Rajya Parishad, the three largest Hindu communal parties in India, and
- (f) the equally unsuccessful attempt by the Marxist left parties of Bengal to unite in a United Socialist Organization in 1950.

Three of the case studies deal with splits (a, b and d) and three with mergers (c, e and f). The first three deal with the center democratic parties, the following two with right wing communal parties and the last with parties on the left. In the three studies dealing with splits we are concerned with:

- (a) what kept the various factions in the party together, and
- (b) what led the factions to split?

The three studies dealing with mergers are concerned with:

- (a) what separated the organizations involved,
- (b) why was the question of merger raised, and
- (c) what were the elements of attraction and repulsion, which won and why?

In all six cases we are concerned with knowing who the initiators of the decisions were and what role the leaders and the rank and file played.

From these six case studies we have extracted certain generalizations centering around the hypothesis that a multi-party system in India has arisen out of the adaptation of a modern western-type democratic parliamentary system by a society operating within certain traditional concepts and a tradition-oriented social structure in the process of change.

We have tried to show that the absence of a consensus on the basic values of democracy, secularism and nationalism had led to a division between the Congress and Socialist parties, among the Hindu communal parties, and among the Communist and Marxist parties. But within each of these broad divisions there are many political parties. In general, this can be attributed to the unwillingness of Indian parties to consider the political consequences of splits or mergers. We have tried to show that this results from:

- (1) widespread ambivalence within many Indian parties toward political power as an objective,
- (2) an unwillingness to accept the democratic process and operate fully within its rules, and
- (3) the presence of certain psychological needs among the rank and file and party leaders which result in the development of intense allegiances to one's own faction, leaders, ideology and political party.

477 pages. \$5.96. MicA 55-2194



POLITICAL SCIENCE:  
INTERNATIONAL LAW AND RELATIONS

THE MAY FOURTH MOVEMENT AND  
ITS INFLUENCE UPON CHINA'S  
SOCIO-POLITICAL DEVELOPMENT

(Publication No. 12,553)

Tse-tsung Chow, Ph.D.  
University of Michigan, 1955

This study aims at presenting and analyzing the May Fourth Movement as a complicated, many-faceted socio-political phenomenon. An understanding of the Movement, which affected and changed in some way almost all aspects of Chinese society, is essential to the comprehension of modern China. Although it has been much discussed in China, many of its major aspects are still little known, even to historians, while the average Westerner has scarcely heard of it. In the present study, emphasis is placed on the main currents of the Movement and their influence upon China's subsequent intellectual, social, and political development. To illuminate these, considerable attention is also paid to historical background, contemporary economic conditions, relevant political and philosophical ideas, the social activities and social psychology of the time and to the matter of personal leadership and participation in the events.

The major events of the Movement took place during the five years of 1917 to 1921 inclusive. The year 1919 marked their height. Faced with a shaky economy and society, the new Chinese intellectuals promoted a vast modernization movement to build a new China through intellectual and social reforms. They stressed primarily Western ideas of Science and Democracy. Traditional Chinese ethics, literature, classics, history, philosophy, religion, and social and political institutions were fiercely attacked. Liberalism, pragmatism, utilitarianism, anarchism, and all varieties of socialism provided stimulus. This intellectual movement soon coalesced with the nationalist sentiments provoked originally by the Twenty-one Demands and intensified by the disposition of Shantung at the Paris Peace Conference. This culminated in the Incident of May 4, 1919, wherein Peking students demonstrated against the Government's pro-Japanese policy. The cause of the new intelligentsia later secured support from merchants, industrialists, and urban workers, and the Government was forced to compromise. This victory of the new coalition facilitated the expansion of the so-called New Culture Movement.

Shortly after this, the May Fourth Movement gradually became involved in politics, and the united front of new intellectuals collapsed. The liberals became conservative or averse to political activity, whereas the left wing of the Movement allied itself with the Nationalists. Western attitudes toward the Movement constituted one major factor in this split. Thereafter Socialism and Nationalism became ascendant, and a multitude of complicated controversies were precipitated. Even the interpretation of the Movement itself became a major point at issue.

The Movement seems to combine drives for national independence and for the modernization of the old civilization. Its major function was that of accelerating the transition of Chinese society from old to new. Confucianism and the traditional ethics were subjected to fundamental and devastating attacks while science and democracy

were exalted. A new vernacular literature was established and popular education was greatly facilitated thereby. The Chinese press and public opinion made great progress. The old family system declined. The cause of women's emancipation gathered momentum. Anti-warlordism and anti-Imperialism developed. Most important of all, the hold of the traditional ruling forces — bureaucrats, old gentry, and landlords — began to loosen, and a new coalition started to take form. These developments contributed to the rise of the labor movement, the rejuvenation of the Kuomintang, and the birth of the Communist Party and other political and social groups.

The defects of the Movement, such as the lack of sympathetic consideration for tradition, the shallowness of many of its intellectual currents, and its lack of patience, are obvious. Despite these, it gave to Chinese society strength, vitality, dynamic drive, and enthusiasm for the new learning. Considering other practical and probable alternatives, one may fairly assert that such a movement was indispensable to the modernization of China.

861 pages. \$10.77. MicA 55-2195

THE POLICIES OF THE LATIN AMERICAN  
GOVERNMENTS TOWARD ISRAEL  
IN THE UNITED NATIONS

(Publication No. 12,772)

Edward B. Glick, Ph.D.  
The University of Florida, 1955

The object of this investigation was to examine the attitudes of so large a group as the Latin American delegations toward so important a United Nations problem as that of Palestine. The United Nations Charter stipulates that all General Assembly decisions on "important questions" must be taken by a two-thirds majority of those member states present and voting. Inasmuch as the Latin American nations comprise exactly one-third of the sixty members of the Assembly, the possibility existed that they exerted much more of an influence in the settlement of the Palestine problem than was generally known.

A careful study was made of the Palestine debates in the world organization, e.g., the first special session of the Assembly, the investigation and reports of the United Nations Special Committee on Palestine, the 1947 recommendation to partition the Holy Land, the second special session, the territorial suggestions of the late Palestine Mediator, Count Folke Bernadotte, Israel's application for admission into the United Nations, and the deliberations concerning the internationalization of the Jerusalem area. The evidence has revealed that both individual Latin American delegations (especially Uruguay and Guatemala) and the region as a whole have, with the exception of the Jerusalem issue, generally supported the Jewish side of the Palestine question. In many cases, this support was crucial in either blocking the adoption of a course of action inimical to the interests of Israel, or in providing a sufficient number of votes to ensure the passage of a United Nations resolution beneficial to Israel.

In order to establish criteria for evaluating the reactions of the Latin American nations to the Palestine question, considerable attention was directed to an identification of the political beliefs or principles which seem

to particularly motivate these countries in the world organization. It was found that among the most important of these beliefs or principles are: (1) humanitarianism, (2) Catholicism, (3) self-determination of peoples, (4) the sovereign and juridical equality of states, and (5) universality of United Nations membership. It was found, too, that these beliefs, which were apparently more closely associated with the Jewish rather than the Arab side of the argument, help to explain why Latin America as a whole has consistently supported almost all of the major political objectives of Zionism and Israel in the United Nations.

Thus the Zionist desire for a sovereign state, which would also serve as a haven for persecuted Jews from elsewhere, appealed to most Latin American delegations on the grounds of humanitarianism and the self-determination of peoples. On the other hand, Latin America's refusal to back Bernadotte's suggestion that a large portion of Israeli territory be placed under Arab control is attributable to the principle of the sovereign and juridical equality of states. For the Bernadotte proposal was made after Israel's establishment, and most Latin American states would hesitate to support a procedure to compel a small state to diminish its domain against its will. Latin America's strong support for the internationalization of Jerusalem is entirely the result of its Catholic tradition. And finally, the nearly unanimous vote of the Latin American nations in favor of Israel's membership application can be interpreted in terms of the general Latin American desire to obtain a universal membership in the United Nations.

However, it should also be noted that if the Latin American countries based their policies in the Palestine situation on certain principles, they were able to do so only because Palestine is located thousands of miles away from them, and because they, unlike other nations, have no political, military, or economic interests in the Middle East.

332 pages. \$4.15 MicA 55-2196

#### CENTRAL EUROPEAN FEDERATION

(Publication No. 12,830)

Joseph Hajda, Ph.D.  
Indiana University, 1955

This is a study of the past failures and future prospects of federation in Central Europe. It attempts to determine when and why the idea of Central European federation came to prominence, and why it has never succeeded. It also points out what is and what is not a federation and endeavors to state the conditions favorable to the future realization of federation in Central Europe.

There were two critical periods in the nineteenth century when the hopes of the federalists in the Habsburg Monarchy were high and when indeed they seemed about to win over their opponents; in 1848-1849 and in 1860. However, the ruling circles of the Monarchy vetoed both federal projects and the Austro-federalists were ultimately the heroes of a lost cause.

The disintegration of the Monarchy in 1918 was visualized by some individuals as a mere preliminary phase to the reintegration of Central Europe on a free, democratic and federal basis. But Masaryk's vision of the new Europe

never came true. The Central European states — Poland, Czechoslovakia, Austria and Hungary — perpetuated the phase of disintegration. In the absence of an effective collective security system they fell prey to German imperialism.

The endeavor of the Czechoslovak and Polish Governments-in-exile to prepare Central European integration on a free and democratic basis was perhaps the most significant project of regional federation drafted during the Second World War. It was a failure mainly because the idea of a union of Poland and Czechoslovakia, eventually enlarged so as to comprise all the states of Central Europe, was not acceptable to the Soviet Union. Federation was vetoed by Moscow and most of Central Europe fell into the Soviet sphere of influence.

Soviet domination prohibits the Central European states even to consider federation. But free exchange of ideas among the exiles produced new schemes and plans of regional federation in Central Europe, visualized as part of a larger European organization.

Even though all endeavors to reorganize Central Europe on a basis which would enable the nations of that region to live a free and peaceful existence have been failures, regional federation remains a possible alternative course of action. The desirability of Central European federation has been urged not only from the standpoint of the people living in that region, but also as a balancing factor in European and world politics. The recent actions of both Germany and the Soviet Union have proved that Central Europe is the most vulnerable region in Europe. If the capacity of this region to resist its powerful neighbors were increased, stability in Europe as a whole would be furthered. Thus the federation could strengthen the chances of peace in Europe.

Central European federation can be attained only under certain favorable conditions. It depends on the freedom of the Central European states — primarily Poland, Czechoslovakia, Hungary and Austria — to choose the federal principle; on their willingness to do so; on their size and internal structure; on their leadership; and on the dominant social and economic forces at work within their respective boundaries. But Central European problems are not merely local, they are world-wide in their implications. Federation depends, above all, on international developments in general and on the behavior of the great powers in particular.

There seems to be little hope that a Central European federal union will come into existence in the foreseeable future. Nor indeed is it a foregone conclusion that federation is the only way of the future, capable of solving all the problems of Central Europe, forever guaranteeing peace and security in that region. Federation is no magic formula. Federation is, however, an old aspiration. Even more, one can see in retrospect how tragic have been the consequences of the absence of an adequate political structure in Central Europe. When aspiration and need point so clearly in the same direction, the goal of federation cannot be lightly regarded. It is not one which we can afford to judge merely from the short run point of view.

169 pages. \$2.11. MicA 55-2197



# ALLIANCES IN INTERNATIONAL RELATIONS SINCE 1920

(Publication No. 12,751)

Eugene Spencer Haugse, Ph.D.  
The University of Nebraska, 1955

Adviser: Norman L. Hill

The purpose of this study is to examine from the point of view of recent practice the nature of alliances as they relate to the balance of power, to international law, and to international organization; and to determine whether or not there are any significant trends in present-day alliances.

The term "alliance" has been used in this paper to describe an association of two or more states, based on a more or less formal agreement by which the states set forth common objectives to be collectively pursued, for whose attainment they pledge measures of mutual aid, including military assistance. This definition requires that military assistance must be among the possible alternatives. It has been common, particularly in America, to distinguish between military and other types of alliances, but technically all alliances are military.

Alliances may be classified according to their purpose, defensive or offensive; according to the nature of the common interests on which they are based, general or special; according to their duration, permanent or temporary; according to the nature of the obligations assumed by each party, equal or unequal. Some of these classifications are specious; others are valid as a means of analyzing the nature of alliances, but are difficult to apply to particular alliances.

Treaties of alliance are legally valid if they have been concluded for legitimate defensive purposes, and if they do not conflict with the United Nations Charter. They are also required by the Charter to be registered with the United Nations Secretariat, although the Charter, unlike the League Covenant, does not declare unregistered treaties to be illegal; it only provides that they may not be invoked before the agencies of the United Nations. All known treaties of alliance in existence have been registered.

The alliance is one of the chief instruments of the balance of power. All through recorded history changes in the balance of power have been accompanied by corresponding shifts of alliances. It is common among idealists to decry the alliance as evil but in the final analysis alliances are inevitable so long as the balance of power remains the chief mechanism for the ordering of power in an anarchic world. The alliance is a form of international organization. It is an agreement for executory action which is the basic element of international organization. The tendency in recent alliances has been toward a greater generality and some observers see in this fact the germ of international government. Their reasoning is that present alliances fall nearly into the category of confederation, that given the proper circumstances they may evolve into confederation, and that from confederation to federation is a logical, if difficult, next step. This is not at all an irrefutable argument but it is one which commands consideration. The Little Entente (1920-1938), the North Atlantic Treaty Organization, and the Inter-American System are frequently cited as alliances having a tendency toward the development of confederation.

It has been possible to arrive at these tentative conclusions: that recent alliances have a tendency to be based on greater generality, to develop more complicated mechanisms of administration, to develop on a regional basis; that, taken together, these tendencies contain the hint of the development of larger international organisms than the nation-state; and that, notwithstanding justified moral criticism of alliances, they are inevitable in a balance of power system. The prospect for the future is for more and more comprehensive alliances.

299 pages. \$3.74. Mic 55-286.

## POLITICAL SCIENCE: PUBLIC ADMINISTRATION

### LEGISLATIVE RIDERS AND FEDERAL PERSONNEL ADMINISTRATION: A CASE STUDY OF THE JENSEN, THOMAS AND WHITTEN AMENDMENTS

(Publication No. 12,701)

Paul Stephen Greenlaw, Ph.D.  
Syracuse University, 1955

During the past twenty years the legislative rider has been frequently employed by the Congress as a means of controlling Federal personnel administration. This dissertation consists of an intensive analysis of three of the more controversial of these riders — the Jensen, Thomas and Whitten amendments. The Jensen amendments, which were attached to nine appropriation acts in 1951 and 1952, placed a prohibition upon the filling of more than one-fourth of the vacancies which occurred in the departments and agencies concerned. The Thomas riders, which were attached to the 1951 General Appropriation Act and the 1952 and 1953 Independent Offices Appropriation Acts, required Federal employees to forfeit annual leave unused within six months after the calendar year in which it was earned. The Whitten riders, which were tacked on to the 1951 and 1952 Supplemental Appropriation Acts and the Third 1952 Supplemental Appropriation Act, established a number of standards of compliance related to personnel programs and procedures during the Korean emergency period.

In this study, the Jensen, Thomas and Whitten riders are analyzed in terms of three aspects: (1) their impact upon Federal personnel administration, (2) the role of executive and legislative groups in their development, and (3) the personnel rider as a technique of legislation. The numerous administrative problems which were created by the riders are examined and analyzed. Attention is focused upon the part which the House and Senate Post Office and Civil Service Committees, the Civil Service Commission, the Bureau of the Budget, the General Accounting Office, the President, the Executive departments and agencies, and the Federal employee unions played in the controversies over the riders. Emphasis is placed upon the techniques which Representatives Jensen, Thomas and Whitten resorted to in introducing their provisions as riders.

Because this study is largely exploratory in nature and deals with only three cases, a large number of conclusions may not be drawn from it. On the other hand, it is believed that the dissertation can be of considerable

value in developing significant hypotheses which may be verified by further research. Observations may be made concerning such aspects of this problem as the type of provisions contained in riders, the behavior of executive and legislative groups in relation to this type of legislation, and the reasons for the frequent use of the rider technique.  
434 pages. \$5.43. MicA 55-2198

**AN ADMINISTRATIVE APPRAISAL OF  
THE U.S. PUBLIC HEALTH MISSION IN LIBERIA**

(Publication No. 12,652)

David Leandor Stratmon, Ph.D.  
University of Michigan, 1955

The purpose of this study is to make an administrative appraisal of the U.S. Public Health Mission in Liberia. The phrase "administrative appraisal" means that answers are sought to four main questions, namely: (1) Why was the Mission sent to Liberia? (2) What field projects were planned and executed to achieve the goals of the Unit? (3) What were some of the major administrative problems encountered? (4) What was the impact of the Mission upon the Liberian Public Health Service?

Most of the data for this study were taken from the unclassified files of the Liberian Mission. These files contain the routine headquarters-field correspondence, which passed between the Mission and the Public Health Service in Washington, D. C. These files also contain a wealth of other material such as the monthly and annual reports submitted by the Unit, reports of inspectors from the Washington Headquarters who visited the Mission at the Monrovia, Liberia Station, and dossiers on the annual budgets for the Health Mission.

The Mission was sent to Liberia in November, 1944, with the dual purpose of protecting the health of American military personnel assigned to that country, and of helping the host government in improving its health facilities. After the end of World War II the main objective of the Unit became that of helping the Liberians strengthen and expand their public health services.

The five major projects undertaken by the Liberian Mission are discussed in this study, namely: (1) malaria control; (2) nursing education; (3) health education;

(4) medical clinics; and (5) medical laboratory and research. The examination of these projects was engaged in mainly to provide a background for the subsequent analysis of the administrative problems of the Mission. An attempt is made to point up in very general terms what the goals of each project were and what techniques were employed to attain these ends.

Four of the most important administrative problems faced by the Unit as it attempted to achieve its post-war objective are discussed, namely: (1) financing the Mission; (2) staffing the Unit; (3) integration of the Mission with the Liberian Government; and (4) headquarters-field relations. Probably the most difficult problem encountered was that of integrating the Mission with the host government after it had operated for several years as an independent agency.

The mission's most telling impact was that it stimulated the Liberians to help themselves, and it demonstrated how some of the major health problems of that country could be attacked most effectively.

Four general conclusions can be drawn from this study. (1) Technical assistance missions similar to the Liberian Health Unit should operate as integrated parts of the host government, rather than as separate and isolated agencies within the host country. (2) Funds donated by the host government to help support units similar to the Liberian Mission should be accepted only on the basis of clear and well-defined frames of reference. (3) The field officials assigned to the programs such as the Liberian Mission should be permitted to take an effective part in planning the annual field budgets. (4) The procedure of having a liaison office in Washington, consisting of one or two officials, to devote special attention to the administrative problems of a field unit such as the Liberian Health Mission can be a useful device.

The experience gained in Liberia was very useful when America undertook to render technical assistance to countries located in the underdeveloped areas of the world. For example, the Liberian experience showed clearly that health missions established in countries like Liberia should not be isolated and separate from the health organization of the host government. Today, when the U.S. Foreign Operations Administration sends health experts to foreign countries to render technical assistance, they work as an integrated part of the host government. They are never separate as was the Liberian Health Mission during its early days.

286 pages. \$3.58. MicA 55-2199



## PSYCHOLOGY

### PSYCHOLOGY, GENERAL

#### AN INVESTIGATION OF THE RELATIONSHIP BETWEEN CATEGORIZING BEHAVIOR AND INTELLIGENCE IN SCHOOL CHILDREN

(Publication No. 12,948)

Leonard Coleman, Ph.D.  
Michigan State University, 1955

An attempt was made to substantiate the hypothesis that conceptualization is primarily a differential function of intellectual capacity rather than purely a function of experience, specifically, that categorizing behavior is more highly related to mental age than it is to chronological age. A concept-formation task of the categorizing type and the Wechsler Intelligence Scale for Children were accordingly administered to 150 children. This included fifty children each at ages seven, nine, and eleven.

Both mental age and chronological age were correlated with four conceptualization scores: (a) number of concepts, (b) mean time per concept, (c) degree of dimensionality, and (d) number of nonfunctional concepts. These four scores were likewise compared to the mental ages derived from the full-scale, verbal-scale, and performance-scale scores of the WISC.

Obtained results substantiated our hypotheses with reference to three of the four variables: the number of concepts achieved, the mean time necessary to produce a concept, and the number of nonfunctional concepts are all significantly related to mental age. Coefficients of contingency from 0.35 to 0.50 were obtained. Similarly, these three variables are more highly related to mental age than to chronological age as such, the differences being most pronounced with full-scale mental age. Analysis of individual age group relationships indicate the differences are more pronounced in the eleven-year-old group with respect to number of concepts and number of nonfunctional concepts, while the differences are more pronounced in the seven-year-old group with respect to the time scores.

The obtained results make possible the conclusion that mental age is a better predictor of categorizing ability (as measured by a nonverbal, categorical sorting type of concept-realization task) than is chronological age. Concept realization of this type is more highly correlated with general intelligence than with the verbal or performance ability measured by the WISC. Future studies involving concept formation should include rigid control of intellectual factors. It is also suggested that results with the categorical concept-formation task be compared with other types of concept formation.

77 pages. \$1.00. MicA 55-2200

#### PROBLEM SOLVING SET IN DIFFERENT AGE GROUPS

(Publication No. 12,773)

Howard James Heglin, Ph.D.  
The University of Florida, 1955

Although there are reasons to expect age differences in problem solving set, no study in the literature offers any systematic coverage of this variable. For this investigation, one hundred subjects in each of three age groups were compared for differences in susceptibility to set, ability to surmount set, and trainability in avoiding set. Two tests were used. One was a variation of the Luchins Water Jar Test, which is a commonly accepted measure of problem solving set. The other was an adaptation of an alphabet maze test found by Cowen and his associates to be comparable to Luchins' test. Half of the subjects in each group were given one test first and half the other. After the first test, a standard explanation was given in which the effects of problem solving set were demonstrated and the subject was warned to avoid them on the second test.

Each age group was composed of fifty male and fifty female subjects. An attempt was made to make the groups comparable to each other in educational and occupational status and representative of their respective populations. The older group (Mdn. age 66.02) members were generally retired. The middle age group (Mdn. age 31.75) were mostly employed and raising families. The younger group (Mdn. age 16.05) were almost all high school students. All were living in Florida when tested.

Four analyses of variance were carried out, one for each test and one for each of two scores, obtained from each test. One score represented the degree to which the subject was susceptible to experimentally induced problem solving set and the other represented the subject's ability to surmount set when it became expedient to do so. Age differences were found to be consistently significant on both scores for both tests. The interaction effects among age, sex, and order of presentation offered complications in interpretation so that separate *t* ratios were computed for the various subgroup comparisons. Analyses of these and of the mean trends revealed that on the first test given, the older group showed generally more set on all measures. The middle age group showed less and the younger group least. However, the middle age group obtained relatively better scores after training, so that they showed least set of any group on the second test. Older subjects again showed most set. All groups tended to show improvement with training, however. Training was relatively more effective in improving ability to surmount set than susceptibility to set.

It may be concluded that age differences do exist in these variables, and should be considered in studies of problem solving set. It seems particularly necessary to allow for age effects when the range of ages among the subjects is large.

76 pages. \$1.00. MicA 55-2201

# STANDARDS OF BEHAVIOR AS A FUNCTION OF SOCIAL CLASS, INTEGRATING SETTING AND CHILD-REARING PRACTICES

(Publication No. 12,654)

Richard Collier Teevan, Ph.D.  
University of Michigan, 1955

This research was designed to test hypotheses derived both from psychoanalytic theory and the writings of social psychologists and sociologists. The purpose was to find out whether certain types of early experiences and social settings are related to indices of later personality.

One hundred twelve junior high school boys and their mothers were selected as subjects from the City of Detroit census. The mothers were interviewed in February, 1953, by graduate students in the social sciences at the University of Michigan. From these interviews information was gained about their child-rearing practices, social class and integration setting. The boys were interviewed from March to June, 1953, by clinical psychologists. From these interviews the boys' conscious moral standards regarding fighting, anger, disobedience and stealing were coded.

It was predicted that middle class parents, in comparison with lower class parents, would begin earlier and be more harsh in weaning and toilet training their children, and would use predominantly psychological punishment, as opposed to direct-attack or corporal punishment. These hypotheses were confirmed.

Integration setting is a social setting variable having two descriptive divisions: the mass orientation and the bureaucratic orientation. The mass person is seen as a striving individual, oriented toward independence and having a great deal of initiative. The bureaucratic person is seen as oriented toward security, the enjoyment of life in the present, and getting along with other people. It was hypothesized that a family with a mass orientation would institute child training earlier and be more coercive in the training than would the bureaucratic family. This hypothesis was not confirmed. Exploration of the relationship of social setting to child-rearing practices revealed that information about both social class and integration setting is needed in order to make an accurate assessment.

The relationships between the social setting variables and conscious moral standards were tested, holding constant one social setting at a time. The prediction that middle class persons would have stronger conscious moral standards than lower class persons was not confirmed.

A further prediction from the social setting variables was that the mass person would have weaker conscious moral standards than the person with a bureaucratic orientation. This hypothesis was confirmed. With social class controlled, the findings were in the predicted direction with three out of eight of them reaching a significant level of confidence.

The relationships of child-rearing practices to conscious moral standards were examined with both social class and integration setting held constant. It was hypothesized that children who were weaned early would have stronger moral standards. This prediction was not confirmed. The data show that stronger moral standards are significantly related to late, rather than early weaning. Contrary to prediction no significant relationships were found between coerciveness of bowel training and the conscious moral standards.

The hypothesis concerning the relationship between type of discipline and conscious moral standards was confirmed. Children who are punished by psychological, rather than direct-attack methods, have stronger conscious moral standards. These findings occur predominantly for the impulse of stealing.

It has been found that there is a relationship between social class and the type of child-rearing used, but that social class does not bear a significant relationship to conscious moral standards. Integration setting, on the other hand, is not significantly related to conscious moral standards. Two of the child-rearing practices — age of completion of weaning and type of discipline — are significantly related to the conscious moral standards while coerciveness of bowel training is not.

144 pages. \$1.80. MicA 55-2202

## A COMPARATIVE STUDY OF THE STABILITY OF A FACTOR STRUCTURE

(Publication No. 12,660)

Steven Gerritjan Vandenberg, Ph.D.  
University of Michigan, 1955

Ninety two students from China studying at American universities were given 35 tests, 11 of which were in the Chinese language, and 24 in the English language. These 24 included the 4 subtests of the Lado English Language Test for Foreign students and 20 tests taken from Thurstone's 1938 PMA study.

The tetrachoric correlations between the scores on these 35 tests were factor analyzed by the multiple group method. This gave rise to seven factors. The residuals were further analyzed by the centroid method. After 13 factors were obtained, graphical rotations led to an oblique simple structure. Seven well defined factors were interpreted as follows:

- |                          |                             |
|--------------------------|-----------------------------|
| I Chinese vocabulary     | V Perceptual speed          |
| II Verbal (English)      | VI Number                   |
| III Memory               | VII Reasoning and induction |
| IV Spatial visualization |                             |

The next step consisted of a rotation of the reduced factor matrix for the 20 PMA tests into maximal congruence with the reduced factor matrix for these same 20 tests from Thurstone's data, according to Tucker's method. This resulted in 12 congruent principal component factors for both the Chinese data and Thurstone's data.

The 12 congruent factors from both studies were then rotated in their common factor space by the Quartimax method, which gave a good approximation to simple structure. Five congruent factors were well defined. These were interpreted to be:

- |            |                     |
|------------|---------------------|
| 1. Spatial | 4. Memory           |
| 2. Verbal  | 5. Perceptual speed |
| 3. Number  |                     |

Tucker's index of similarity  $\phi_r$  was calculated for these five congruent factors. The values found were:

Spatial	.873	Memory	.830
Verbal	.910	Perceptual speed	.730
Number	.855		



These values compare well with other values reported for the similarity between factors found in two studies, where the subjects in both studies were American.

In addition to the 35 tests, the Chinese students were asked to fill out a questionnaire about the amount of their experience with the English language and some other items held to be indicative of their familiarity with the English language. Tetrachoric correlations were calculated between the responses to each item and the 35 tests, so that it was possible to compute the correlations between these items and the seven oblique factors obtained from the multiple group factor analysis. Only five of these were significant at the 1% level of significance. They were the following:

Factor V and b (age at first instruction in English)	.62
Factor V and k (amount of English newspaper reading)	.48
Factor V and m (feeling of handicap in taking tests)	.46
Factor S and e (sex of the subject)	.67
Factor P and d (age of the subject)	-.55

In addition there was a spurious correlation of .48 between factor S and l (speaking mainly Chinese outside of classes), produced by the fact that several groups of engineering students roomed together.

Although the correlations of 3 questionnaire items with the verbal factor show that cultural influences play a role in the development of a factor, the main conclusion arrived at is that there are several independent potentialities in the human neurophysiological organization which are at least partly free of the particular cultural environment in which these potentialities are developed.

85 pages. \$1.06. MicA 55-2203

## PSYCHOLOGY, CLINICAL

### VISUAL FORM RECOGNITION LEARNING DEFICIT IN PARANOID SCHIZOPHRENIC WOMEN

(Publication No. 12,934)

John Edward Bryant, Ph.D.  
University of Cincinnati, 1955

Major Instructor: Professor Arthur G. Bills

This study attempts to bring additional evidence to bear on two leading theories of psychological deficit in schizophrenia through an investigation of the visual form recognition learning behavior of paranoid schizophrenic women. Specific hypotheses derived from these theories are tested by means of rigorous experimental and statistical controls, and the learning performance of the patients is examined for indications of factors associated with the deficit.

The first of these theories is the impaired motivation theory of Hunt and Cofer (1944). In keeping with the requirements of the theory, a test of ability for sustained attention or concentration is employed as the operational index of motivation. A group of paranoid schizophrenic women and a highly similar group of normal women are equated on this task and then tested for differences in figure learning.

The second theory, the integral impairment or "deterioration" view of schizophrenic deficit, is represented in this study by the impaired abstract behavior hypothesis. This hypothesis is tested by first equating the groups on a parallel learning task which offers little or no advantage to an abstract-conceptual approach. The groups are then tested for differences in figure learning where the abstract approach (and therefore the normal group) theoretically enjoys an advantage.

A third hypothesis investigated in this study holds that the deficit is due to a reduction in such non-mediational or performance factors as perceptual speed and learning. This hypothesis was derived from an analysis of the figure recognition learning task as primarily a performance task. It is tested by equating the groups on a task of perceptual speed and learning and then testing for differences in figure learning.

In addition, two hypotheses bearing on the question of the existence of impaired abstract behavior in the patients are investigated.

The figure learning performance of the patient group was characterized by an inferior initial level of performance, a slower rate of improvement throughout, and marked variability. The range of ability extended from those who exhibited no deficit whatever to those who appeared genuinely incapable of learning. Only one fourth to one third of the patients clearly exhibited some degree of deficit.

Generalized hypotheses of psychological deficit of the type investigated failed to account for the figure learning deficit of paranoid schizophrenic women. The deficit is not a function of impaired concentration, defective motivation, nor impaired abstract behavior. The patient group utilized was not characterized by impaired abstract behavior nor impaired ability for sustained attention or concentration.

The patients' deficit on this task may be regarded as a function of a reduction in such performance factors as perceptual speed and learning. Ultimately it is due to whatever conditions are responsible for this reduction.

The conditions found to be associated with retarded learning rates among the patients were: withdrawal and depression, perseveration in error, failure anxiety and temperamental factors, and genuine inability. Several of these conditions are reported to affect performance on tasks of perceptual speed and learning adversely also.

The conclusions from the data are limited by the sample size and the stringent selection and matching criteria employed. They can be applied only to the type of groups studied.

193 pages. \$2.41. MicA 55-2204

### PSYCHOLOGICAL CORRELATES OF THE PHYSIOLOGICAL RESPONSE TO MECHOLYL IN PSYCHIATRIC OUTPATIENTS

(Publication No. 13,322)

Shirley M. Corrigan, Ph.D.  
University of Minnesota, 1955

Adviser: Ephraim Rosen

The purpose of the study was to investigate the relationship between psychological test findings and the response to a parasympathetic nervous system stimulant, Mecholyl.

Eighty-four World War II and Korean veterans who were evaluated for treatment at the Minneapolis Veterans Administration Mental Hygiene Clinic were selected for the study. All patients who were evaluated during a five month period were included except those who were grossly psychotic, in panic states or had a medical history which contraindicated the procedure.

Each patient was given a test which is purported to measure autonomic nervous system functioning. The test involved the injection of Mecholyl, followed by a series of blood pressure readings. The blood pressure readings yielded a pattern which could be grouped according to Funkenstein criteria. The test was followed by standardized questioning about subjective reactions. A battery of psychological tests was given within seven days of the Mecholyl test. Those used in the study were the MMPI, Shipley-Hartford, and the Biographical Data Sheet.

The data were analyzed to ascertain the following relationships: (1) MMPI scores and the following: Mecholyl groupings, good-bad prognosis (based on the Funkenstein criteria of good prognosis which include hypotensive blood pressure reaction, anxiety or "chill" precipitated by Mecholyl), and individual variables used in determining the groupings. (2) Shipley-Hartford subtest scores and good-bad prognosis. (3) Sixteen Biographical Data Sheet items and good-bad prognosis.

The findings indicate that the good prognostic groups are sicker, according to MMPI scores, than the poor prognostic groups. Good prognosis is related to higher T-scores on the Pd<sub>o</sub> and D<sub>o</sub> scales and a lower score on Pd<sub>s</sub>. The good group is distinguished by the more frequent appearance of code 8 (Sc) in the first third of the code and less frequent occurrence of 3 (Hy) in the first third of the code and also by a significantly greater number of starred profiles (T-scores above 90). The trend of differences was consistently in the direction of higher Pa, Pt, Sc, and Si in the good group. The S-O scales rendered differences with O higher in the good group. Presence of anxiety was related to higher scores on Pd<sub>o</sub>, Pa, Pa<sub>o</sub>, and Sc scales. Presence of a "chill" was related to higher scores on F, Pa, Sc, Ma<sub>o</sub>, and Si scales and a lower score on the Hy<sub>s</sub> scale. If there was a rebound in the blood pressure above the basal pressure, there was a significant difference in groups according to the extent of rise. The group with the higher rise had significantly lower scores on Pa<sub>s</sub> and Si scales.

Funkenstein criteria groups with good and poor prognosis can be differentiated by the MMPI. The differences show consistently that the sicker group has a better prognosis. The degree of sickness factor may be directly related to acuteness of illness and it may mark some optimal time at which treatment is successful and beyond which the process is irreversible. If the autonomic test were useful only in broadly identifying the treatable from the untreatable, it would be of value, but it seems to hold promise in the selection of patients for specific treatments. However, for this to be achieved, additional research must be done to establish some of the crucial relationships between autonomic functioning and psychological disturbance. It is suggested that the Funkenstein groupings need to be defined more adequately in order to reduce the variance within the groups. Also, criteria for improvement should be defined in operational terms.

94 pages. \$1.18. MicA 55-2205

#### THE RELATIONSHIP OF BASIC RORSCHACH SCORING CATEGORIES TO OBSERVED THREE-MAN-GROUP INTERACTION BEHAVIOR

(Publication No. 12,769)

Arthur E. Eschenbach, Ph.D.  
The University of Florida, 1955

This study was designed to explore the relationships between Rorschach scoring categories and overt behavior in group interaction as measured by the Bales' "Interaction Process Analysis Technique." The Rorschach scoring categories were also related to supplementary information provided by intelligence tests, sociometric choice questionnaires, on-the-job ratings, and background information questionnaires.

The sample consisted of 126 airmen each of which underwent two and one-half days of observation and testing. All the subjects were observed in three-man-groups in role playing situations and actual situations. Several low but significant correlations between Rorschach scores and the behavioral scores were obtained. Forty-three hypotheses relating the authoritative interpretations of Rorschach scores to the individual behavior in three-man-groups were then tested. The testing of hypotheses particularly indicated the validity of the interpretation of the R score and of the Rorschach measures of intelligence. However, the results obtained when testing the remainder of the hypotheses indicated that one would be on tenuous ground when the interpretations or generalizations implicit or explicit in Rorschach theory were jointly considered for predictive purposes. The high relationships found between R and the criteria, and the high relationship found between  $\bar{R}$  and other Rorschach variables indicated the possibility of a "productivity factor". The possibility of a "productivity factor" and the many high relationships found between the Rorschach scores suggested that future research concerned with improving the Rorschach scoring system could include a factor analysis based on correlation coefficients reported in this study.

119 pages. \$1.49. MicA 55-2206

#### THOUGHT, COMMUNICATION AND SOCIAL INTEGRATION IN SCHIZOPHRENIA: AN EXPERIMENTAL AND THEORETICAL STUDY

(Publication No. 13,012)

John H. Flavell, Ph.D.  
Clark University, 1955

The purpose of this thesis was twofold: first, to describe and discuss an experimental study pertaining to certain aspects of schizophrenic thought, communication and social behavior; and second, to present a theoretical orientation relating to broader aspects of normal and schizophrenic thinking.

A survey of the literature suggested that the testing of the following hypotheses might prove fruitful: (a) schizophrenics tend to be relatively deficient in the ability to think abstractly and in the ability to communicate thoughts effectively to others; (b) within a group of schizophrenics, the ability to think abstractly, the ability to communicate



effectively to others, and the ability to interact adequately with others in everyday social situations would be positively intercorrelated. The experimental study designed to test these hypotheses was conducted as follows. A group of twenty normals and a group of twenty-four chronic schizophrenics, matched for education and verbal intelligence, were compared in performance on two tests. The first of these, called the Word Meaning Test, measured subjects' preferences for abstract, essential versus concrete, non-essential meaning relationships between words. The second test, called the Inner Speech Test, involved the ability to communicate successfully to others, in writing, the characteristics of visual stimuli seen only by oneself. These two tests were our experimental measures of abstract thinking and effective communication respectively. The quality of the patients' day to day social relationships was rated by psychiatric nurses on a rating scale designed for this purpose.

The prediction that the normals would surpass the schizophrenics in abstract thinking, as measured by the Word Meaning Test, was confirmed by the experimental results. Discussion of group differences on this test stressed the relative inability of schizophrenics to differentiate meaning relationships in terms of more essential-less essential. The hypothesis that the normals would exceed the schizophrenics in communicability as measured by the Inner Speech Test was likewise confirmed. A detailed qualitative analysis of the test protocols suggested that the schizophrenics' overt communicative inferiority was the reflection of a developmentally immature, socially undifferentiated conceptual approach to communication. Of the expected intercorrelations among abstract thinking, effective communication and adequate social integration within the schizophrenic group, only the correlation between abstract thinking and social integration proved to be statistically significant. A more exhaustive post hoc analysis suggested some possible explanations for the inconclusiveness of the obtained intertest findings and also suggested, for future research, more definitive experimental approaches to the problem.

The remainder of the thesis was taken up with the presentation of a microgenetic theory of normal and schizophrenic thinking based in part upon the conceptions of Schilder and Mead. According to this theory, schizophrenic thoughts are immature or abortive conceptions in the sense that they have failed to pass through the four stages of a normal thought's development which the theory posits. In failing to undergo certain of the later developmental stages, these abortive thoughts variously fail to acquire the reality-orientation, organization and communicability which the ego's role playing activities ordinarily bestow on mature thought productions. A number of speculations derived from the theory concerning classification, etiology and treatment in schizophrenia were offered for future clinical and experimental investigation.

232 pages. \$2.90. MicA 55-2207

# VERBAL BEHAVIOR OF SCHIZOPHRENIC AND NORMAL SUBJECTS AS A FUNCTION OF TYPES OF SOCIAL REINFORCEMENT

Publication No. 12,897)

Clarence Henry Hartman, Ph.D.  
State University of Iowa, 1955

Chairman: Professor Leonard D. Goodstein

This study was designed to evaluate the effectiveness of three types of stimuli, presented by E, as reinforcing agents, and to evaluate the relative effectiveness of these stimuli on schizophrenic as compared with normal Ss in their manipulating verbal behavior.

The Ss used were 84 Psychiatric Aides and 84 in-patients diagnosed Schizophrenic Reaction from the Veterans Administration Hospital, Knoxville, Iowa. The Ss' task was to construct sentences beginning with one of four available pronoun choices. Four experimental procedures were employed during 60 acquisition trials and each of the 84 Ss from each diagnostic population (normal and schizophrenic) were randomly assigned to one of the four treatment groups. For the first treatment group E said "Good" following all sentences starting with "I" or "We", the criterion response. For the second treatment group E gave a "Nod" of the head following a sentence beginning with the criterion response. For the third treatment group E gave a "Shake" of the head following a sentence beginning with a non-criterion response. In the control group E refrained from any of these stimuli. The acquisition trials were preceded by 20 preliminary trials and followed by 80 extinction trials during which E refrained from introducing any of the treatment procedures.

On the basis of previous studies it was expected that:

1. The frequency of criterion responses for reinforced groups would increase during the acquisition trials.
2. The frequency of criterion responses would not decrease during the extinction trials as a function of the cessation of reinforcement.

On the basis of clinical literature it was expected that:

3. Schizophrenic Ss would show greater increments in criterion response than normal Ss in the negatively reinforced group.
4. Normal Ss would show greater increments in frequency of criterion response than schizophrenic Ss in the positively reinforced groups.

A control variable, level of initial response preference, was introduced in the analysis following the collection of the data. This variable was found to contribute markedly to the total variability of the data. An interdependence of trials, reinforcement type, diagnostic category, and levels was clearly demonstrated and consequently, no generalized statements of the effect of the various types of reinforcement can be made. Despite some qualifications, there is good evidence that "Good" and "Shake" are effective reinforcers, the evidence for "Nod" being somewhat less direct. No differential effectiveness of the various types of reinforcement on the two diagnostic populations was clearly demonstrated, however, the introduction of the levels variable revealed marked differences between the two populations with the schizophrenic Ss showing more persistence of preferred response tendencies than normal Ss. It is suggested that this finding implies that it is difficult to modify

schizophrenics' behavior, not because social rewards are ineffective, but because of strong competing habit structures.

An interdependence of trials, diagnostic population, reinforcement type, and levels was obtained over the last block of acquisition trials and first block of extinction trials. It was found that extinction occurred only for some positively reinforced groups and for none of the negatively reinforced groups. An analysis of the data from the first through the last block of extinction trials showed no changes in the frequency of the criterion responses during these trials.

The findings of the present study emphasize the need for utilizing response preference as a control variable with this type of experimental task, and the need for further research to investigate possible relevant variables.

73 pages. \$1.00. MicA 55-2208

**ASSESSMENT OF ADJUSTMENT IN CHILDREN AND ADOLESCENTS: RELIABILITIES AND INTER-RELATIONSHIPS CONCERNING COMMON GROUP TESTS AND RATINGS AND THEIR RELATIONSHIPS TO JUDGMENTS FROM CLINICAL TESTS**

(Publication No. 12,990)

Eldon Ernest Jacobsen, Ph.D.  
University of Washington, 1955

The purpose of this study was to assist in accomplishing the first step of the long term research, proposed by the Washington State Department of Health, of evaluating the mental health programs of various communities. Assisting in determining reliabilities of, and interrelationships among, instruments and methods available for assessing adjustment of school children was a more specific purpose. Two general hypotheses were tested. The first hypothesis was that there are some assessment methods used by teachers which indicate with significant stability the relative adjustment level of school children. The second hypothesis was that there are some group measures of adjustment which relate significantly with clinicians' ratings of adjustment.

A representative sample of public school students in grades one, three, five, seven, nine, and eleven was selected. These 720 students were used as subjects during one school year in order to obtain information on 25 measurement variables with respect to their possible value as criteria of adjustment. The measures were classified into five categories: adult ratings, peer ratings, self ratings, efficiency measures, achievement measures. Teachers administered tests, inventories, and peer rating devices and filled out the teacher rating scales when supplied by the researcher. Other measures were obtained from school records on each child and from his parents. Most every measure was obtained twice at definite intervals. Stability coefficients were calculated for most all of the measurement variables. Each measure was correlated with every other measure, at the six different grade levels, to show their interrelationships.

A sample of 31 third- and eleventh-grade students were selected to represent the larger sample for clinical testing. These students were given the Rorschach, Thematic Apperception Test (TAT), and Wechsler-Bellevue Intelligence

Scale or Wechsler Intelligence Scale for Children for third-graders. Their test protocols were read independently by two clinical psychologists who made judgments about each child's total adjustment. The judgments were made using "blind" analyses of the test protocols and without familiarity with the population characteristics from which the children were drawn.

The first general hypothesis was supported, that there were some assessment methods used by teachers which indicate with significant stability the relative adjustment level of school children. The hypothesis was supported to the extent that 52 out of 54 stability coefficients, using total scores, were statistically significant. It seems likely that some measures with at least acceptable stability are available for use in studies of the effectiveness of mental health programs, for 50 out of 54 stability coefficients were found to be above .60.

Correlation coefficients showing the interrelationships between the various approaches to the measurement of adjustment showed that the relationships were generally sufficiently low that one measure could not legitimately be substituted for another. This held not only between the general areas but within the more specific areas such as the Guess Who and Classroom Social Distance Scale approaches to secure peer ratings and two different inventories used to secure self ratings.

The second hypothesis, that there are some group measures of adjustment which relate significantly with clinicians' ratings of adjustment, was not generally supported. Ratings on adjustment by "blind" analyses of three clinical test protocols made independently by the two psychologists showed low equivalent coefficients. Correlations between group measures of adjustment and each of the clinician's judgments of adjustment were insignificant when using one clinician's ratings, and 5 of 11 correlation coefficients were significant at the five per cent level of confidence using the second clinician's judgments. Lack of specific definition of adjustment and the clinicians' unfamiliarity with the population from which the study sample was drawn may have accounted for the general lack of positive results when using clinicians' "blind" analyses of the Rorschach, TAT, and Wechsler-Bellevue battery.

The results were discussed with implications for future study of community mental health programs.

415 pages. \$5.19. MicA 55-2209

**THE EFFECT OF VARYING TIME INTERVALS ON THE REPRODUCTION AND RECALL OF RORSCHACH RESPONSES ON RETEST**

(Publication No. 12,956)

Bertram H. Schneider, Ph.D.  
Michigan State University, 1955

The purpose of this study was to investigate the consistency of Rorschach results on retest where subjects were not exposed to any treatment other than the systematic varying of the time intervening between the tests. Specifically, it was to determine the differential effects of the passage of time on the persistence, change and recall of Rorschach responses on retest.



Two hypotheses were set forth: 1) performance on the Rorschach in terms of repeated responses on retest remains constant over varied short time intervals; 2) recall of those responses decreases as a function of the length of time between tests.

Sixty patients screened to assure exclusion of those with neuropsychiatric conditions were selected as subjects from a VA general medical and surgical hospital. The subjects were distributed into three groups of twenty, equated for age and intelligence. Each group was retested with the Rorschach after the following approximate time intervals: group I, four hours; group II, two weeks; group III, two months. Following the retest of each subject, his responses were individually read back to him and he was asked if these responses had been given in the initial test. Following this recall procedure a questionnaire, designed to obtain a verbal report of the effect of recall on the retest, was administered to each subject.

Two techniques were used to obtain data to test the hypotheses. The response-comparison technique was a matching procedure, by means of which each pair of Rorschach protocols were compared for common or consistent responses. The recall technique was a scoring method by means of which accuracy in the identification of retest responses as new or repeated responses was determined. The two techniques yielded seven measures which were tested for significance of differences among the three groups by the t-test.

The results on the whole confirmed both hypotheses. It was found that the measures of consistency devised to test the first hypothesis did not yield significant differences among the three groups, regardless of the length of time elapsed before retest. The measures of recall devised to test the second hypothesis decreased as a function of the length of time between tests. It is concluded on the basis of the results that retest consistency is not to be solely accounted for in terms of recall.

The verbal reports of the subjects are compatible with this finding. Forty per cent of the subjects reported that it was the stimulus properties of the cards that seemed to elicit the same responses on retest. This may be compared to 13% who reported that it was recall that seemed to be of primary importance in eliciting the same responses.

The results also indicated that the percentage of new responses on retest was 25.0 after four hours, 32.2 after two weeks and 29.5 after two months. The verbal reports suggest that ease of concentration, curiosity and desires to be more thorough were some conditions related to the production of new responses.

99 pages. \$1.24. MicA 55-2210

# PERCEPTUAL STRUCTURIZATION AS A FUNCTION OF EGO STRENGTH: AN EXPERIMENTAL APPLICATION OF THE RORSCHACH TECHNIQUE

(Publication No. 12,961)

William Ellsworth Thomas, Ph.D.  
Michigan State University, 1955

The present research was designed to test the general hypothesis that two groups of subjects, composed respectively of normal college students of high and of low ego

strength, would show differences in perceptual maturity as measured by the Rorschach technique.

From an analysis of ego strength as described and employed by outstanding proponents of psychoanalytic theory, the concept emerged as referring essentially to the potential for mental health. This potential implies a relative freedom from symptomatology of a nonorganic sort, and a capacity for effective, goal-oriented behavior which meets, in general, with social approval. A joint measure of ego strength (1, 2) was employed which appears, on both rational and empirical grounds, to relate closely to this psychoanalytic conception.

Thirty high ego strength and thirty low ego strength subjects were selected from among 336 college students and administered the individual Rorschach procedure. Their protocols were scored by a reliable scale of perceptual maturity designed to implement Werner's (3) theory of genetic development. The responses of the high ego strength group, as compared with those of the low group, showed a general trend toward greater perceptual maturity. The highs tended to produce more responses of a differentiated and hierarchically integrated sort. They also tended, more than the lows, to produce responses which, while not to be described as hierarchically integrated, were none-the-less discrete, definite, and clearly differentiated. The "lows" exceeded the "highs" in certain of the more primitive types of perception: in amorphous percepts and percepts of only vague form qualities, and in those having form requirements which were but poorly met by the stimulus blots. Both groups produced very few of the more labile and syncretic types of perception.

The general trend of the results thus closely paralleled theoretical predictions, throughout the range of the genetic scoring system. Statistically significant differences between the two groups, however, were obtained only for the "Genetically High" category (consisting of clearly differentiated responses plus hierarchically integrated ones) and the Vague category. The high group exceeded the low group in the former category, while the low group exceeded the high group in the latter category.

The most interesting result was the much greater frequency with which vague percepts were produced by low ego strength subjects. The nature of these percepts is such as to suggest a kind of groping for a solution of inadequately perceived situations. While the study tends clearly to relate vague perception to low ego strength in normal college students, the differences obtained are not sufficiently great to promise much in the way of practical utility.

A suggestion for future research, arising incidentally from the data, is that the implications of Werner's theory of development might profitably be extended beyond the form or structural aspects of perception to such other dimensions as shading and color. Such an extension may afford greater sensitivity in Rorschach evaluations.

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74 pages. \$1.00. MicA 55-2211

## PSYCHOLOGY, EXPERIMENTAL

### AN ANALYSIS OF ROTE SERIAL POSITION EFFECTS IN TERMS OF A STATISTICAL MODEL

(Publication No. 12,819)

Richard Chatham Atkinson, Ph.D.  
Indiana University, 1955

This research represents an experimental and theoretical analysis of the acquisition of anticipatory rote serial responses in a situation characterized by the following restrictions: (a) word exposures of two seconds duration; (b) 'dissimilar' intralist words; (c) words familiar to the subject and easily pronounced. Three experiments were performed to lay the groundwork for theoretical considerations and to provide a set of data appropriate for quantitative analysis in terms of the model presented.

Two of the experiments employed Latin square designs. In the first, subjects learned a different 14 word list each day for three consecutive days with intertrial intervals of 4, 10, and 60 seconds. In the second experiment, subjects learned lists of 9, 14, and 19 words with a 30 second intertrial interval; one list was learned per day for three consecutive days. In both of these studies the subjects performed a symbol cancellation task between trials. In order to evaluate the effect of this intertrial activity a third study was run in which two groups learned under identical conditions with the exception that one of the groups was required to cancel symbols during the intertrial interval while the other was not.

The major empirical findings, in terms of measures summed over the first 15 trials, are summarized below. I. An increase in the length of the intertrial interval is accompanied by: (a) a decrease in the number of response-failures over the posterior list positions; (b) a decrease in the number of perseverative errors; (c) a shift in the position of maximum response-failures toward the anterior end of the list; and (d) no change in the relationship between the positions of maximum response-failures and maximum anticipatory errors.

II. An increase in length of list is accompanied by: (a) an increase in the number of response-failures over the first five list positions; (b) no change in the relative position of maximum response-failures; and (c) a decrease in the likelihood that the position of maximum anticipatory errors will be anterior to the position of maximum response-failures.

III. The absence of a task during the intertrial interval is accompanied by: (a) a decrease in the number of response-failures and anticipatory errors over the anterior list positions; (b) a shift in the position of maximum response-failures toward the posterior end of the list; and (c) no change in the relationship between the position of maximum response-failures and the position of maximum anticipatory errors.

A set of concepts for a theoretical consideration of the rote serial learning situation was presented from the viewpoint of statistical learning theory. These concepts were quantitatively formulated in terms of finite difference equations, and the solutions of the equations were presented. Relationships between experimental observations and aspects of the model were considered.

83 pages. \$1.04. MicA 55-2212

### TEMPORAL ASPECTS IN CONDITIONING THE GALVANIC SKIN RESPONSE

(Publication No. 12,766)

William Baylor Bierbaum, Ph.D.  
The University of Florida, 1955

**Problem:** This experiment investigated the temporal gradient in the classical conditioning of the impedance change GSR for human Ss, using partial reinforcement.

**Procedure:** Five experimental groups of thirty randomly selected freshmen males were trained, using one of the following CS-UCS onset intervals for each group: -3.0, 0.0, 0.5, 3.0, and 5.0 secs. For the control group the stimuli were not paired. Twenty trials were given in one sitting, with 45 secs. between trials. The UCS was presented in random order from trial to trial.

**Results:** Amplitude, frequency, latency, and recruitment data were analysed.

**Conclusions:** (a) There is a temporal gradient which has a maximum at the 3.0 sec. interval; (b) The impedance method of representing GSR is consistent with the physiological approach to the GSR.

59 pages. \$1.00. MicA 55-2213

### STRENGTH OF SECONDARY REINFORCEMENT AS A FUNCTION OF BOTH THE FREQUENCY AND THE AMOUNT OF PRIMARY REINFORCEMENT

(Publication No. 12,855)

Myron Brender, Ph.D.  
New York University, 1955

**Advisers:** Prof. Leland W. Crafts and  
Prof. Frank N. Marzocco

The purpose of this study was to investigate the strength of secondary reinforcement as a joint function of both the frequency and the amount of primary reinforcement. Two subsidiary variables, the color and the location of the positive goal-box, were also incorporated into the final experimental design to provide for maximal experimental control.

A total of 108 albino rats (72 comprising Replication I, and 36 comprising Replication II of the experiment) were trained, under conditions of water-deprivation, to traverse a runway to a goal-box containing water. With the exception of the first day, the discrimination training method was employed throughout this initial training phase of the experiment.



The number of reinforced trials administered to each animal varied according to the group to which the animal had been assigned, one group receiving 75 trials, another 50 trials, and the third 25 trials. The amount of water located in the positive goal-box also varied for each animal according to its group assignment, one group receiving 18 drops of water, another 6 drops, and the third 2 drops. For half the animals, the white goal-box was positive, and for half the black goal-box was positive.

After completion of the initial training on the straight-away, the animals were tested for new learning on the T-maze. For half the animals, the positive goal-box was located in the left arm of the maze, and for half it was located in the right one. The Ss were permitted 15 non-reinforced trials on the maze, the criterion of new learning being the number of entries into the positive goal-box. The initial training trials on any one day and all of the ensuing new learning trials were administered under conditions of massed practice.

It was demonstrated that training procedures employed in the initial learning phase of the experiment were adequate to produce learning. Analysis of the results of Replication I of the experiment indicated that no significant differences in learning were attributable to the experimentally controlled variables: amount of primary reinforcement, frequency of primary reinforcement, goal-box color, and goal-box direction. Significant interactions were discovered, however, between the variables, amount of primary reinforcement by goal-box direction, and among the three variables, frequency of primary reinforcement by goal-box color by goal-box direction.

The failure of the results of Replication I to confirm the findings reported in previous studies indicating that the strength of secondary reinforcement varies directly with the frequency of primary reinforcement, and the absence of any rationale capable of accounting adequately for the two significant higher-order interactions suggested the possible operation of a sampling error within this replication. To test this hypothesis, the size of the sample was then increased by the addition of Replication II.

Subsequent analysis of the pooled results of Replications I and II again failed to disclose any significant differences within any of the four main effects. However, the heretofore significant second-order interaction, frequency of primary reinforcement by goal-box color by goal-box direction, no longer attained a level of statistical significance; and the significant first-order interaction, amount of primary reinforcement by goal-box direction, declined in statistical significance from the 1 per cent level of confidence to the 5 per cent level.

This decline in the  $F$ -level of both significant higher-order interactions was held to be evidence tending to support the hypothesis that the previously high level of statistical significance attained by these inexplicable interactions probably had been an artifact attributable to the operation of chance.

119 pages. \$1.49. MicA 55-2214

# LEVELING AND SHARPENING AS MANIFESTED IN DISCRIMINATION LEARNING, THRESHOLD AND PROBLEM SOLVING BEHAVIOR

(Publication No. 12,860)

Clifford Deutscher, Ph.D.  
New York University, 1955

Adviser: Professor Robert Silverman

The purpose of the study was to investigate the thesis that the manner in which a given individual perceives and responds to his environment shows demonstrable consistency from situation to situation and thus constitutes a personal style. The styles chosen for investigation were those of leveling and sharpening. Levelers are persons who tend to structure their environment in broad, homogeneous categories, being relatively unaware of change and degree of difference. Sharpeners, on the other hand, are particularly sensitive to nuances and change.

The subjects were one hundred veterans at the Brooklyn Veterans Administration Hospital.

All subjects were tested in four situations, a schematizing test, a discrimination learning test, a weight lifting test and a problem solving test.

It was hypothesized that all subjects would manifest consistency in performance in all four situations, and that levelers and sharpeners, chosen on the basis of their behavior on the Schematizing Test, would perform significantly differently from each other in the other three situations.

Consistency was investigated by product moment correlations done among all tests for all subjects. The hypothesis received partial confirmation in that all signs were in the predicted direction, every test was significantly correlated with at least one other test and three of the six intercorrelations were significant at the .05 level of confidence or better. All differences between levelers and sharpeners were found to be significant at the .05 level of confidence or better. The findings relating to differences were considered also to lend support to the hypothesis of consistency, since they presented evidence for a generalized ego-control principle manifesting itself in a predictable way in a variety of situations.

61 pages. \$1.00. MicA 55-2215

## INTEROCULAR TRANSFER WITH CONTROL FOR CONJUGATE EYE MOVEMENT

(Publication No. 12,949)

Eugene Sinclair Edgington, Ph.D.  
Michigan State University, 1955

Such phenomena as stereoscopic vision and binocular rivalry in animals with binocular experience appears to be inconsistent with Hebb's idea that binocular experience builds up common visual pathways in the brain. Stereoscopic vision is not a simple superposition of two images: the effect is different if the stimuli for the two eyes are exchanged. Why should this exchange of stimuli make any difference if there is a simple fusion through a common path in the brain without respect to which eye originated the visual impulse?

Since one of Hebb's main arguments for common neural pathways is interocular transfer, consideration should be given to the problem of interocular transfer to see if it might be explained without recourse to the concept of common visual paths.

One such explanation might be that the interocular transfer is carried out through conjugate eye movement, by re-instating an "approach pattern" of eye movement in the original trained eye, even when it is covered. No common visual pathways would be needed.

This thesis is based on two experiments that were carried out to test the hypothesis that conjugate eye movement is not necessary for interocular transfer. The first experiment was concerned with interocular transfer of the ability to read inverted words; the second with transfer of mirror-tracing ability. Six experimental subjects were used in the first experiment and five experimental subjects in the second experiment. All subjects were adult humans with considerable binocular visual experience. The hypothesis that conjugate eye movement is not necessary for interocular transfer could not be rejected in either experiment.

After these experiments had been carried out, the writer received unpublished experimental results from Dr. Chow that indicate that conjugate eye movement, in the absence of binocular vision, is not sufficient for interocular transfer. Dr. Chow's results, in conjunction with the lack of evidence from the present study for the necessity of conjugate eye movement in interocular transfer, suggest that other factors than conjugate eye movement will probably be more profitable for study to determine whether conditions other than common visual pathways in the brain might explain interocular transfer.

Hebb's concept of common neural pathways is not necessarily inconsistent with the concept of separate visual pathways: the region in the nervous system where the impulses from the two eyes arouse a common pattern may be beyond the region involved in stereoscopic perception and other phenomena that apparently necessitate a distinction between the impulses from the two eyes; i.e., certain perceptual processes may occur while the impulses from the two eyes are still distinct, whereas the paths may later converge into a common pattern of excitation.

76 pages. \$1.00. MicA 55-2216

#### ETHNOCENTRISM, REPORTED PARENT ATTITUDES, AND PARENT CHILD RELATIONSHIPS

(Publication No. 12,896)

Sue Allen Warren Gruen, Ph.D.  
State University of Iowa, 1955

Chairman: Professor Boyd R. McCandless

This dissertation reports a study of the relationships between ethnocentrism (as measured by the California E Scale) and certain attitudes toward child rearing practices (as measured by the University of Southern California Parent Attitude Survey); between ethnocentrism and Open Conflict with parents and Concealed Conflict with parents (as measured by instruments designed for this study); and between ethnocentrism and attitudes toward a course in "Psychology of Family Relations" for which the Ss of the study were registered.

Each of the 72 female white Gentile college students who served as Ss was asked to fill out the E Scale and the Parent Attitude Survey (PAS) as she believed would express her own attitudes and as she thought her mother would fill it out to express the mother's attitudes. Ss were identified only by code number.

Low positive relationships were found between E Scale scores and Dominating and Possessive attitude subscales of the PAS and a low negative correlation was found between E Scale scores and the Ignoring PAS subscale.

When the Ss responded to the E Scale to express their mothers' attitudes, a low positive correlation was found between the S's own E Scale score and perceived Possessiveness of the parent. The low E Ss (lower 28%) reported attitudes that would indicate adherence to more Dominating child rearing practices on the part of their mothers than the middle E Ss (middle 54%), but not statistically significantly more than the high E Ss (upper 28%).

There was a moderate positive correlation between the self E Scale scores and the perceived-parent E Scale scores. The correlation could not be accounted for merely on the basis of identical marking of items on both the self and the mother scales.

High E Ss (upper 28%) were rated as more likely to show Concealed Conflict than low E Ss.

High E Ss rated themselves as lower in Open Conflict with their mothers than did low E Ss.

The higher the discrepancy between the self and the parent ratings on the E Scale, the higher the Open Conflict rating with the mother tended to be.

High E Ss had a significantly lower discrepancy score from their perceived-parent scores on the E Scale than did the low E Ss. Although it failed to reach statistical significance at the 5% level, the trend was for high E Ss also to have a lower discrepancy score between the self and the perceived-parent scores on the PAS than the low E Ss; the use of weighted scores on the PAS may have obscured relationships on this scale, however.

There was some tendency for the Ss above and below the median on the E Scale to list different types of reasons for taking the course in "Psychology of Family Relations" but the differences obtained with the small number of Ss in each of the groups was small.

No relationship was found between the E Scale score and the rating of the course.

Results of the study were reported and a discussion of the results was made in terms of the concordance between these results and other studies reported in the literature. Suggested interpretations were made in terms of clinical theories.

81 pages. \$1.01. MicA 55-2217

#### EXPLORATION AND LEARNING IN A THREE-DIMENSIONAL MAZE BY RATS WITH RESTRICTED EXPERIENCE IN ONE DIMENSION

(Publication No. 12,581)

Eugene Rae Harcum, Ph.D.  
University of Michigan, 1955

This study investigated the effects of a particular experiential restriction in the very young rat on later exploration and learning in the mature animal. The plan was to show that exploration and learning are related, and that



each is influenced by previously formed perceptual organizations. It was hypothesized that the animal would perform less well on a given task if relevant aspects of it are not familiar via his past experience.

The generality of the restriction was specifically investigated.

Three groups of rats were reared in different environments. The Control Group lived in regular 14 x 14 x 20 inch cages. The Vertical Group was housed in cages that permitted climbing up and down, but not horizontal turns, and was presumed to be restricted in experience with the right-left horizontal dimension. The Horizontal Group was reared in a living cage that permitted horizontal locomotion and turns, but no climbing. This group was presumed to be restricted in experience with the up-down dimension.

All animals at about nine months of age were allowed to explore a three dimensional alley maze while satiated for food and water. They were then given a learning task requiring all vertical turns. The following results were obtained.

1. Horizontal rats explored less than Control or Vertical rats. The differences between groups decreased with repeated testing so that the Horizontal rats, if tested longer, may have eventually surpassed the controls. The Vertical Group was considered not to be deficient in conceptual development of horizontal relations because it did have experience in one horizontal dimension, and because it was indistinguishable from the Control Group on the total exploration and learning measures.

2. The exploration of the two restricted groups was more stereotyped and, therefore, less "good" than control animals.

3. Horizontal rats made more errors on a task requiring vertical turns than the Control and Vertical Groups.

4. If a rat has had extensive experience in only one spatial plane, he will apparently not be able to generalize this experience to the relatively unexperienced dimension. He makes more errors in learning tasks involving that dimension than non-restricted animals. There was only one exception to the general superiority of Vertical and Control animals over the Horizontal animals on the learning task.

There were several other results of the present experiment:

- a) Restricted animals manifested a slight initial preference for familiar turns.

- b) Generally rats who manifested a preference for horizontal turns did more total exploration than rats preferring vertical turns.

- c) In an older group of rats there was a significant negative correlation between total amount of exploration and number errors on the learning task. For a younger group the correlation was positive and not significant.

The above experiment indicates significant differences between restricted and control rats on the measures of exploration and learning used. Both differences favor the control rats.

There are both specific and general effects of the restriction imposed in this experiment. One can infer that rats cannot transfer completely the experience in one spatial plane to the relatively unexperienced dimension, but that they can perform as well as control animals on tasks utilizing the experienced dimension. However, emotional or motivational differences between restricted and control rats were found regardless of the exact nature of the restriction.

136 pages. \$1.70. MicA 55-2218

## THE EFFECT OF ELECTROCONVULSIVE SHOCK AND PENTOTHAL ANESTHESIA ON MAZE LEARNING AND RETENTION

(Publication No. 12,995)

Francis Parker Leukel, Ph.D.  
University of Washington, 1955

Experiments using 125 rats investigated the relationship between the trial-to-electroconvulsive shock time interval and learning behavior. A process of habit trace consolidation may follow each learning trial. An ECS treatment following each trial could impair learning by: (a) interrupting consolidation, or (b) retroactively disorganizing the consolidating trace. Subjects were given different treatments in three experiments after each of the first ten daily trials of learning a 14-unit water maze. The interval between each trial and the following treatment was varied.

1. A group given ECS two hours after each treatment trial made significantly more mean errors than controls during treatment trials but recovered in seven trials after discontinuing treatment. Rats given ECS at 1, 5, or 30 minute intervals did not differ from the two hour group during treatment trials but required more than 20 trials to recover and showed marked stereotypy of error behavior. Total maze scores to criterion were a function of the trial-ECS interval. This interval appeared to govern the duration, rather than the magnitude, of the ECS effect on maze behavior. A lasting trace disorganization seems indicated.

2. "Punishing" leg shocks at one and five minute intervals had no effects on maze behavior comparable to those of ECS.

3. Anesthetization with intraperitoneal sodium pentothal, injected one minute after each treatment trial, slows maze acquisition during treatment trials (time and error scores). Ten recovery trials are required. One control group was injected with water one minute after each treatment trial, a second was anesthetized at a 30 minute interval, and a third received no injections. Anesthetization appears to slow learning by interrupting trace consolidation after each trial. While ECS should have the same effect, the ECS effect seems to be more permanent. When administered before consolidation is complete, ECS probably acts to retroactively disorganize the consolidating trace.

242 pages. \$3.03. MicA 55-2219

## PROACTIVE INTERFERENCE AND FACILITATION AS A FUNCTION OF AMOUNT OF TRAINING AND MOTIVATIONAL LEVEL

(Publication No. 12,913)

David Stuart Palermo, Ph.D.  
State University of Iowa, 1955

Chairman: Professor Alfred Castaneda

The present experiment was concerned with the relation of drive strength (D) to performance in a complex learning situation. The specific theoretical implication investigated was that the performance of stress Ss (high drive) would be inferior to that of non-stress Ss (low

drive) in a task that involved the presence of competing incorrect responses stronger than the correct responses but that the performance of these same stress Ss would be superior on the same task when the correct responses were stronger than the competing incorrect responses. Further, the experiment investigated the theoretical implication that the greater the magnitude of the difference between the strength of the correct and the incorrect habit the greater would be the differences between the performance of the high and the low drive groups.

Seventy-six fourth grade Ss were given 20 trials on a learning task in which four S-R connections had to be learned in a psychomotor task. Two of the S-R pairs received more trials in the training period than the other two. Ss were then randomly divided into two groups of 38, one relearned the task under a stress condition and the other worked under the same conditions as in the training situation. One of the strong trained S-R pairs and one of the weak trained S-R pairs were re-paired in the transfer task and the other two pairs remained the same as in the training period.

The results were in agreement with the theoretical expectation that the stress (high drive) Ss would make more errors on the changed S-R pairs than the non-stress (low drive) Ss. Further, these differences were increased with increases in the strength of the dominant incorrect habit. The results on the unchanged pairs tended to be in the expected direction but were not statistically significant, i.e., the stress group made fewer errors on the unchanged S-R pairs. The lack of expected interaction on the unchanged pairs was discussed in terms of the approach to the asymptote of performance by both non-stress and stress groups.

Statistically significant increases in errors on the changed pairs and decreases in errors on the unchanged pairs were found as a function of the strength of the habits involved.

Learning to learn was controlled in this experiment by giving all the subjects the same total number of training trials but varying the number of trials to specific S-R connections.

70 pages. \$1.00. MicA 55-2220

# FATIGUE AS A FUNCTION OF SITUATIONAL VARIABLES — AN EXPERIMENTAL STUDY OF SOME NON-ENERGISTIC FACTORS IN THE PHENOMENON OF TIRING

(Publication No. 12,955)

Robert S. Ramsay, Ph.D.  
Michigan State University, 1955

## A. PROBLEM

Individuals can feel tired and worn out without seriously exerting themselves. In other circumstances they may expend considerable energy and not feel tired. Obviously tiredness may result from muscle-impairing work, but it would appear that it may also occur under conditions of little or no energy expenditure. This study explores the development of fatigue in situations designed to keep the tiredness of muscle impairment at a minimum.

## B. APPARATUS, PROCEDURE, AND DATA

Thirty-two subjects were individually employed in the

following context. The seated male subject made appropriate verbal responses to simple rectilinear figures which were projected onto a screen ten feet before him.

The stimulus figure changed every three seconds. This fact was recorded kymographically by way of impulses from the projector's sound track. A similar record was kept of the subject's responses by way of an adapted carbon throat-microphone and the same relay system. The latencies thus acquired were hand measured and all of the standard statistics derived from them.

The subjects were divided into eight experimental groups, each of which was distinctively "aligned" to a task which all groups performed in common. This task consisted of responding verbally to simple but meaningful geometric figures as one displaced another on the screen at three-second intervals. The task was designed to command attention, provide opportunity for break-down of integrated effort, and to consume little energy. Each subject was stopped after 400 responses which constituted four times through the endless film loop. He then provided a retrospection on his tiredness at different stages of the task. A mechanical "tiredness reporter" made it possible for him to report tiredness during the test. Observations were also available from the experimenter and an assistant.

Numerous controls were established to underscore and stabilize the effect of three non-energetic independent variables: 1) the intensity of need to do well on the task, 2) apparent distance in time and energy to the proposed goal, and 3) degree of knowledge of "appropriate" mediating behaviors. These variables were dichotomously presented as implied by the 2x2x2 factorial design. The resulting experimental groups represented various shadings of favorable and unfavorable work-alignment.

## C. RESULTS

The need factor, whether or not significance was attached to the individual's performance, had no effect on the speed at which the subject worked or on the error tendency of his work. It did, however, significantly affect his reported tiredness, low need producing greater feelings of tiredness. The distance factor, the subject's estimate of the "cost" of the task to himself, slowed up and scattered performance significantly when the distance was remote. It also contributed significantly to felt tiredness. The definition factor, the structuring of mediating pathways, produced significantly slower responses and greater dispersion and increased reported tiredness, when presented unfavorably. Interaction between the independent variables was conspicuously small.

Independent of experimental grouping, there was a highly significant correlation between impoverished performance and reported tiredness. Those who maintained relatively high effectiveness under adverse task orientation often showed compensatory behaviors. Subjective states seemed systematically affected by the work situations.

126 pages. \$1.58. MicA 55-2221



# A STUDY OF PERSONALITY PROCESSES OPERATIVE UNDER NEUTRAL, FAILURE, AND SUCCESS CONDITIONS

(Publication No. 13,024)

Henry William Von Holt, Jr., Ph.D.  
Clark University, 1955

This study attempts to clarify some personality processes which are important under neutral, failure, and success conditions. Results from the writer's earlier study suggested that: the imaginal processes were important under neutral conditions; the processes of emotions and their control, in addition to tendencies typically expressed in behavior, were important under failure conditions; and that tendencies not typically expressed in behavior were important under success conditions. These were set up as hypotheses to be tested in the present experiment.

The measures of behavior under the three conditions were obtained by the administration, under each of these conditions, of the Needs Apperception Test (N.A.T.), a modification of the T.A.T. Essentially, this test requires the subject to estimate the strength of certain needs of the depicted person on the T.A.T. cards. The N.A.T. measure of achievement was taken as a measure of the imaginal processes when given under neutral conditions, and a measure of the processes of emotions and their control when given under failure conditions. N.A.T. measures of dominance and succorance were also taken. Under failure conditions these were supposed to reflect the corresponding tendencies of the subject shown in his typical behavior. Under success conditions these N.A.T. measures were hypothesized as measuring the strength of tendencies toward dominance and succorance not typically expressed in behavior. Fifty-seven adult, normal males were given this test under neutral, failure and success conditions.

Independent and accepted measures of the personality processes hypothesized were required. All subjects were given Rorschach Tests and the Worcester Social Attainment Scale interview. From the Rorschach Test the total number of responses with a movement component (Sm) was taken as a measure of the imaginal processes. Waldman's control score, Fx — a measure of the relative dominance of form over other determinants (excluding movement) — was taken as a measure of emotional processes and their control. Some of the sub-scales of the Worcester Social Attainment Scale were judged as measures of the strength of the typical tendencies of the subject toward dominance and succorance. These same sub-scales were also taken as being inversely related to the respective tendencies toward dominance and succorance not typically shown in behavior.

The two main hypotheses were essentially confirmed. The N.A.T. measure of achievement under neutral conditions was reliably related to the Rorschach index, Sm. The N.A.T. measure of achievement under failure conditions was reliably related to the Rorschach control score, Fx. Further analyses strongly suggested that the most important process in the latter relationship was that underlying impulsivity.

Additional statistical analyses brought out that the Rorschach measure, the Index of Perceptual Maturity, was reliably related to the achievement measure under failure conditions. This measure reflects the degree to which the subject articulates and integrates, appropriately, the Rorschach blot areas.

Thus three processes were proposed as being measured by the N.A.T. measure of achievement. These are: (1) the imaginal processes (under neutral conditions); (2) the processes of impulsivity (under failure conditions); and (3) a form-integrative process (also under failure conditions).

The N.A.T. measures of dominance and succorance obtained under failure conditions were reliably related to some of the proposed sub-scales of the Worcester Social Attainment Scale. This partial confirmation led to the interpretation that role-taking behavior represents another aspect of the manner in which an adult adjusts to a failure-stress situation — the role which he adopts towards others when he is under stress.

The hypothesis that tendencies not typically expressed in behavior would be measured by N.A.T. measures of dominance and succorance obtained under success conditions was not confirmed. The present study does not clarify the significance of the success condition.

118 pages. \$1.48. MicA 55-2222

# THE ORGANIZATION OF THE VISUAL RESPONSE

(Publication No. 12,963)

Frank Ray Wilkinson, Ph.D.  
Michigan State University, 1955

The current tendency is to interpret visual phenomena as the end products of a series of neural events occurring in the retina, optic pathways and optic cortex of the organism. One theory as to the functioning of these neural elements has been called the "alternation-of-response" theory. This theory assumes that the optic tract consists of a number of parallel pathways which cooperate in transmitting information from the retina to the optic cortex. In the perception of flicker, when the pulses are delivered at rapid rates, these pathways alternate in their responses to the individual pulses, so that each pulse is responded to, but any single pathway is not responding to every successive pulse of stimulation. In support of this theory it has been shown that a pulsating stimulus gives rise in the cortex to bursts of nervous activity which do not follow the stimulus either in terms of frequency or intensity at first, but which later come to follow the stimulus pattern closely. This initial period of somewhat erratic fluctuation of response has been called the period of "reorganization", in reference to the "sorting out" of the pathways into functional, harmonic groups. The present study is an attempt to investigate the perceptual concomitants, if any, of this period of "reorganization" by presenting to the eye of the observer short trains of pulses, the lengths of which in terms of number of pulses are well within the period of "reorganization". In this situation, the observer reported the number and character of flashes seen. The results indicate that there exists at the beginning of stimulation, a corresponding perceptual organization with a number of characteristics in common with the period of neural "reorganization" mentioned above. Certain features of the results are seen to be clearly in line with the hypothetical events postulated by the "alternation-of-response" theory, and the theory is extended to account for flicker fusion as a special case of steady vision.

64 pages. \$1.00. MicA 55-2223

## RELIGION

### A CRITICAL STUDY OF JOHN WESLEY AS PRACTICAL THINKER AND REFORMER

(Publication No. 12,960)

William Ernest Sweetland, Ph.D.  
Michigan State University, 1955

The major purpose of John Wesley's ministry was to promote a vital, practical, dynamic Christianity which would lead ultimately to salvation, and would in the meantime make life on earth a fuller, richer experience. The three basic doctrines advocated by him to carry out his purpose were justification by faith, the new birth, and Christian perfection. True freedom for man, the primary goal of the eighteenth century, would begin with his release from the bondage of sin, and the restoration of the soul to its original purity — its natural state — would be accomplished gradually through following the doctrine of Christian perfection. The person experiencing such a change would show his love for God and man by taking an active part in the religious, social, economic, and political life of his community.

Wesley's intense interest in practical considerations lead to a failure on his part to give adequate attention to the more theoretical aspects of Christianity, and made him impatient with theories of any kind. He was unable to appreciate the educational theories of Rousseau, the political theories of Priestley and Price, and the writings of Montesquieu and Voltaire, since they did not meet the standards of Scripture, reason, and experience which were applied by Wesley to every problem or activity.

For John Wesley individual character and intellect were the prime movers in human progress, with the desired character and intellect resulting from an adherence to Wesley's basic doctrines and the application of his standards to every problem. He felt that involved theology was not necessary to a proper understanding of Christianity, and might prove to be a handicap to those attempting to follow

his doctrines. The core of his teachings was his insistence upon a life of purposive activity in which the individual was the key to a better future both for himself and his community.

The Wesleyan emphasis upon personal experience had a strong appeal, as the rapid growth of the movement shows. Not so readily apparent, but equally important, are the inconsistencies in Wesley's thought. The most glaring inconsistency lay in his insistence upon the primary importance of individual thought and experience, while at the same time he was equally concerned with conformity to the demands of certain groups. The Church of England, for example, was considered by Wesley to have means of grace which were indispensable to salvation. The government of England was, he thought, the best then in existence, since it gave every individual civil and religious freedom. Under the Wesleyan concept, however, that freedom was restricted. The freedom desired by Wesley was not what the individual's reason and experience might lead him to expect, but rather freedom to do what he should want to do, and what they should want was freedom under the laws of England.

The greatest strength of Wesley's teachings was identical with their greatest weakness — his emphasis upon the practical aspects of Christianity. His doctrine of Christian perfection was admirably suited to the times, particularly to the people to whom Wesley preached. The decision made very early in his career that he was going to preach to the poor determined the level and approach of his teachings. The level was dictated by the limited understanding of his followers; the approach by their needs. His greatest strength lay in his ability to satisfy those needs through an appeal the people could understand. His greatest weakness lay in his belief that actions or knowledge not based upon what he understood to be reason, experience, and Scripture were not worthy of attention.

202 pages. \$2.53. MicA 55-2224



## SOCIAL PSYCHOLOGY

### FACTORS ASSOCIATED WITH SUPERVISORY SUCCESS IN THE OPERATING ROOM: OCCUPATIONAL SELECTION AND ADJUSTMENT

(Publication No. 12,376)

Jack Vincent Buerkle, Ph.D.  
State University of Iowa, 1954

Chairman: Professor Harold W. Saunders

It was the purpose of this study to identify, and determine the institutional significance of, certain attitudinal factors which might ultimately be utilized for the prediction of supervisory success within the operating room suite of a general hospital. An important part of this undertaking was the construction of an attitude questionnaire, the purpose of which was to act as a medium for the identification and delimitation of five attitudinal areas thought to be important for the problem at hand.

The underlying orientation for the research was the structural-functional approach, with special emphasis on situational analysis. The project had its beginning when the researcher was able to spend a seven month period as a participant observer in the operating room suite of the State University of Iowa General Hospital.

It was during this period that the salience of the universalistic type of norm became evident.

In an attempt to discover the institutional significance of this kind of norm, a questionnaire which would allow the simultaneous measurement of universalism-particularism and four other attitudinal dimensions thought to be logically related to it was constructed. The questionnaire took a form which presented various hypothetical situations, each involving a universalistic-particularistic value conflict.

The populations studied were the four classes of degree students, College of Nursing, State University of Iowa, a National Sample of Operating Room Supervisors and a Special Operating Room Supervisory Group. The rationale for submission of the instrument to scalogram analysis, and questions concerning reliability and validity of the instrument were treated from the point of view usually associated with Guttman scaled questionnaires.

The data were collected and analyzed for the populations studied, in three separate, but related, phases. First, the instrument had been constructed, then its scalability for the attitudinal dimensions under consideration, was determined. Secondly, a trend analysis of attitudinal development with respect to degree of advancement in nursing was conducted chronologically with respect to the groups under study. In this phase, the investigator attempted to ascertain the institutional significance of the dimensions for the hypothetical operating room situations. Finally, the predictive significance of the attitudinal areas for an outside criterion measurement was determined.

The findings indicated that there were, for nursing students, significant associations between universalism-

particularism and degree of advancement in nursing education. The above also held true for the relationship between type of supervisory group and universalism-particularism. There were no significant associations between degree of advancement in nursing education and the areas of extensity, intensity, and evaluation of supervisory confidence. Chi square analysis revealed that there were also significant associations between type of supervisory group and extensity, intensity and evaluation of supervisory confidence.

In the study of the relationship between attitudinal areas, it was revealed that the association between universalism-particularism and self-evaluation increases steadily through the nursing educational program, levels off with O.R. national sample supervisors, and makes a sharp decline with the special supervisory group.

The areas of extensity and intensity were correlated with universalism-particularism for the College of Nursing, proved to manifest interesting and wholly unanticipated results. For the correlation of both dimensions with universalism-particularism, the association increased through the sophomore year, but with the introduction to clinical practice, there were reversals in association.

Two dimensions proved to have predictive significance for the outside criterion. These were universalism-particularism which was significantly and negatively correlated with the criterion, and self-evaluation which was significantly and positively correlated with it.

It was the opinion of this researcher that concentration on situational analyses of work groups, such as the above, is a parsimonious technique for bringing into focus some of the attitudinal relationships which can bring the behavior scientist closer to his ideal goal — the general law.

174 pages. \$2.18. MicA 55-2225

### THE COMPLIANT BEHAVIOR OF DEVIATES UNDER CONDITIONS OF THREAT

(Publication No. 13,319)

Harvey Burdick, Ph.D.  
University of Minnesota, 1955

The purpose of this study is to isolate the conditions that give rise to and determine the frequency of two kinds of opinion change: (a) a change that is only overt (public change) and, (b) an overt change that is accompanied by a private conviction (private change). A public change was operationally defined as a change which reverts when the source of influence is removed. A private change was defined as a change which was maintained in the absence of the influence source.

An experiment was conducted so that the relationships between threat, pressures toward uniformity and the nature of the change could be tested. The three major hypotheses

tested were: (a) as the pressures toward uniformity increase the proportion of private changes increase, (b) public change will occur when a threat for non-compliance is present, (c) the frequency of public change will be inversely related to the magnitude of the pressures toward uniformity.

Pressures toward uniformity were generated from two sources. One was the attraction of the group (cohesiveness) and the other was the perceived relevance of the issue to the group (relevance). Groups of high and low cohesiveness and groups of relevance and irrelevance were produced. These four experimental variations were duplicated under conditions of threat and non-threat, making eight experimental conditions in all. Each group was composed of from five to seven members of the same sex. There were eight groups in each condition except for the high cohesive non-threat condition where there were seven groups. The subjects were high school students.

The topic presented for discussion was the effect curfew had upon the scheduling of high school events. The discussion was held by writing notes to one another. All subjects, regardless of the position taken on an opinion poll, were informed that they disagreed with all the other members of the group. Thus every subject saw himself as a deviate.

The notes the subjects received, although ostensibly coming from the other subjects, were previously prepared by the experimenter. All subjects voting for the same position on the first ballot received the same first two notes. All subjects in the Threat condition, regardless of the position taken, received the same two threat notes (last two notes). The two notes that were substituted for the threat notes in the Non-Threat condition made no reference to the two positions. The notes were delivered at three minute intervals after the start of the discussion period.

Measures of opinion were taken with two ballots and an anonymous questionnaire. The success of the cohesiveness and relevance manipulations was measured by a questionnaire given at the end of the discussion period.

For the most part the results bear out the predictions stated in the hypotheses. It was necessary, however, to use the notes the subjects wrote in the classification of the changes. When this was done it was noted that there was proportionately more private change in the high than in the low cohesive groups both in the Threat and Non-Threat conditions. The relevance manipulation was not as successful as the cohesive manipulation. The comparison between the relevance and irrelevance groups was further complicated by the fact of having increased the resistance to private change of the members in the relevance variation. While there was more private change in the relevance than in the irrelevance groups in the Threat condition this difference was reversed in the Non-Threat condition. There was significantly more public change in the Threat than in the Non-Threat condition. There was more public change in the low cohesive and in the irrelevance variations than in the high cohesive and relevance variations respectively.

98 pages. \$1.23. MicA 55-2226

## A SOCIOMETRIC STUDY OF THE FRIENDSHIP STATUS OF COLLEGE WOMEN

(Publication No. 13,216)

Maryann Ehrhardt, Ed.D.  
Indiana University, 1955

Chairman: Louis G. Schmidt

The purpose of the study was to attempt to find factors which seem to facilitate or inhibit the establishment of friendships by college women. The basic hypothesis was that there were certain identifiable characteristics, circumstances, and interests which limit or enhance a college woman's acquisition of friendship choices from her associates.

The college women studied were 450 students enrolled in a midwestern teachers college.

There were two approaches to proof of the basic hypothesis. The first was to derive the degree of association between friendship status and selected factors. An individual's friendship status was the number of times she was listed as a friend by other women students. This first approach involved computing the coefficient of correlation between friendship status and each of the following factors: friends listed, reciprocal friendship choices, acquaintance status, acquaintances known, ACE scores, academic average, activities, evaluation of participation in activities, hours worked per week, and week ends spent away from campus per quarter. The second approach was to compare a high friendship status group and a low friendship status group. The two groups were compared on the basis of the factors listed above and also on the basis of: housing unit, sorority affiliation, major field of study, college class, dates per week, parents' occupations, ratings of appearance, and problems indicated on the Mooney Problem Checklist.

For the first approach, the significance of the Pearson product-moment coefficients of correlation was determined by consulting the Wallace-Snedecor table of coefficients of correlation significant at the 5 per cent level and 1 per cent level for varying degrees of freedom. For the second approach, the significance of the difference between the means, medians, and percentages for the two groups was ascertained through application of the t-ratio test of the null hypothesis. Here, too, the significance was found at the 5 and 1 per cent levels of confidence.

Analysis of the results of this study seemed to indicate the following main conclusions: (1) College women with higher friendship status listed more friends, had more friendship choices reciprocated, knew more other women on campus, and were known by more other women than those with lower friendship status. (2) The higher friendship status students tended to have higher academic averages than the lower friendship status students. (3) Those with higher friendship status participated in more activities and received higher evaluation averages for their participation than those of lower friendship status. (4) Women with higher friendship status spent more week ends on campus and lived in larger housing units than the women with lower friendship status. (5) Those in the high friendship status group were usually sorority members, single, and more attractive and better groomed than those in the low group. (6) There was a greater proportion of physical education majors in the high group than in the low group;



there were no significant differences in the other major fields. (7) Part-time employment and college class were not found to be related to friendship status. (8) Relatively more of the fathers of the high group were employed in the professional and managerial occupations; whereas relatively more fathers of the low group were employed in the semi-skilled occupations. (9) Proportionately more students of the low group were concerned with the Mooney Checklist problems: (a) "Being timid or shy," (b) "Missing someone back home," (c) "Too easily led by other people." 122 pages. \$1.53. MicA 55-2227

**THE VERBAL BEHAVIOR OF BILINGUALS:  
THE EFFECT OF LANGUAGE OF REPORT  
UPON THE THEMATIC APPERCEPTION TEST  
STORIES OF ADULT FRENCH BILINGUALS**

(Publication No. 12,571)

Susan Moore Ervin, Ph.D.  
University of Michigan, 1955

The focus of the research was on the problem of the influence of the language spoken upon what is said. The central hypothesis was that bilingual speakers tend to associate each language with the standards of conduct common among speakers of that language. If second language learning occurs in a new community, a person may also learn to alter the content of speech in conformity with new cultural patterns. Such a shift in content might occur whenever there is a generalized shift in usage to the second language, or it might be associated with its specific speech forms. In the latter case, the greater the degree to which an individual introduces speech forms from either language into the other, the less the difference in content between the two languages. Linguistic interference in each language should in turn be predictable from the subject's learning history and current attitudes and skills.

The subjects were 64 adult French bilinguals living in Washington, D.C., but of French parentage and upbringing, and not fully bilingual until after adolescence. Three types of data were collected from each subject: (a) interview material about his learning of English and current usage of both languages. (b) A test of language dominance, consisting of a bilingual word association test with responses in the language of the stimulus word. The dominance score was the median difference in response latencies in the two languages. (c) Two sets of Thematic Apperception Test stories, one set in each language. Half the subjects told French stories at the first session, and half English stories. Stories in both languages were transcribed from recordings and analyzed for content and for linguistic interference from the other language.

The analysis of content revealed differences between the French and English stories for both groups which were for all medians in the direction of the hypothesized differences between French and American middle-class culture. Themes involving verbal aggression against peers, and rejection or assertions of independence were significantly greater in the French stories for one of the groups, and those involving physical aggression, escaping blame, and achievement (in women subjects) were more frequent in English.

A translation procedure introduced for control purposes showed that stories scored in translation did not yield significantly different content scores from the stories scored in the original language.

There was no support for the expected inverse relationship between linguistic borrowing in both languages and the degree of content difference. Significant variables for the prediction of linguistic interference were, for interference in French, the degree of education of the subject, and for interference in English, the degree of French dominance in terms of current skill. The latter appeared to be true only for the university-educated subjects, or those who reported no inhibition of interference, or frequent language shifting with bilingual speakers. The linguistic measures were new and will require considerable refinement to increase reliability and success in prediction.

It was concluded that there are systematic differences in the content of speech of bilingual subjects in their two languages. The differences in content are apparently related to differences between the cultures of the two linguistic communities. 229 pages. \$2.86. MicA 55-2228

**MODES OF ORIENTATION AMONG  
PROTESTANT CLERGYMEN:  
AUTHORITARIANISM AND HUMANISM**

(Publication No. 12,753)

Louise Miller Kanter, Ph.D.  
The University of Nebraska, 1955

Adviser: Alan P. Bates

The purpose of this study was to determine the extent to which Erich Fromm's formulation of authoritarianism and humanism could validly be applied to a specific occupational group, namely the Protestant clergy.

A basic concept used in formulating the problem was mode of orientation. This concept was introduced to denote an hypothesized "trend toward consistency" in three specified dimensions of analysis: personality, ideology and behavior. The assumption was made that two modes or orientation, authoritarianism and humanism, could be distinguished among members of the Protestant clergy, and that each of these modes would contain pattern consistency in terms of the above-mentioned dimensions.

Specific tools were used to measure each of the dimensions. The F Scale as developed by Frenkel-Brunswick, et al in the Authoritarian Personality was used to measure personality. Sermons were analyzed to get at ideology. An open-minded questionnaire and a series of projective questions were used to probe the behavioral dimensions. A group of 40 Protestant ministers, selected randomly, was interviewed.

The findings of the study definitely point to the fact that the ministers who were investigated could be distinguished on the basis of authoritarian and humanistic modes of orientation. The more salient lines of differentiation will be listed below.

Humanistic: On the basis of the empirical findings, the humanistic mode of orientation contains the following characteristics for the Protestant clergy of this sample:

## (1) Ideological

- Theism:** The humanist holds God to be significant in terms of what effect the man-God relationship has for the world.
- Ethics:** The emphasis lies not so much in determining what is right and wrong, but rather on the development of self in such a way that man can fulfill himself. A Christian life which is "forward-looking" and directed toward others is seen in relation to self-satisfaction.

## (2) Behavioral

The humanist is concerned with helping people. And he believes, when people are troubled, that to be an effective "helper" attention must first be directed toward the person's temporal rather than his spiritual (man-God) problems. Hence, his interest in counseling and learning about psychology so that he can increase his effectiveness.

As a minister, he is still very concerned with the spiritual well-being of people, but he sees this as something which can not be effectively achieved if a person is emotionally disturbed.

**Authoritarian:** The authoritarian mode of orientation contains the following characteristics:

## (1) Ideological

- Theism:** The authoritarian holds God as all-powerful. He is to be worshiped; the more man humbles himself before God, the more assurance he has that he will "get" from God. Man is nothing and can do nothing without God.
- Ethics:** The authoritarian sees right and wrong in terms of a God-given code. In this code lie the rules by which man must govern himself. By acting in accord with these rules man will gain God's favor and will be rewarded.

## (2) Behavioral

The authoritarian is only concerned with getting people right with God. He sees his role as attending to the spiritual needs of man. He further believes that there is a God-given technique for attaining spiritual well-being. As a man of God it is his duty to see that these ritualistic formulas are attended to by people under his jurisdiction. For without these techniques man cannot know God and is lost.

Furthermore as a repository and carrier of Christian values, he must enforce God's code on earth. In this sense he becomes primarily a judge. His only concern with human behavior in the world is to see that it conforms to the code.

117 pages. \$1.46. MicA 55-2229

# PERCEPTIONS AND BEHAVIOR IN THE DEVELOPMENT OF SOCIAL POWER RELATIONSHIPS

(Publication No. 12,607)

George Klaus Levinger, Ph.D.  
University of Michigan, 1955

This study was initiated in order to investigate an individual's perceptions and behavior regarding the development of his power relations with another person. This development was considered to be the product of a social feedback process. In other words, over the course of a relationship, interpersonal perceptions and behavior continually modify one another.

The following theory was outlined to account for the determinants of the development of social power or influence: A group member's power is based upon his ability to satisfy or to deprive the needs of the other members. Within the context of social groups, need satisfaction is contingent on the availability of various kinds of resources. A member's social power therefore depends on his potentiality for providing or withholding important resources which are relevant for the group's functioning. The information at the group's disposal about each member's resource potential gives rise to perceptions concerning the members' relative power.

In consequence of this theory, a number of hypotheses were presented concerning the development of social power perceptions and behavior. One general hypothesis was that perceptions of own power and behavior relevant to power (i.e., influence attempts, resistances, and degree of assertiveness) will vary together during an individual's participation in a group. It was also hypothesized that an individual's power perceptions and behavior are determined by the information he has concerning his own resources relative to those of other members.

In a laboratory experiment, sixty-four subjects, each paired with a trained assistant, participated in a series of decision-making episodes. The behavior of the assistant was carefully prearranged and the outcomes of the decision-making trials were controlled. Data were gathered concerning the trial-to-trial changes in the subjects' perceptions and behavior and it was possible to trace the various fluctuations.

Subjects were exposed to three experimental manipulations in the information regarding the partner's relative resources: (a) the initial information about the partner's potential task ability, (b) the degree to which the partner accepted or rejected a subject's influence attempts, and (c) the favorableness of an observer's evaluation of the subject's relative task performance, given after the first half of the session.

Significant correspondences were found between the subjects' power perceptions and behavior. Subjects' perceptions of their relative power and their power behavior toward their partner varied together over the length of the experimental session. Fluctuations in the subjects' power perceptions stabilized over time. Also, while each of the experimental manipulations exerted a significant effect, the information conveyed by the variations in the partner's influence behavior had the greatest effect for changing the subjects' perceptions. Finally, the feedback of information concerning their influence on decisions produced more



immediate changes in subjects' perceptions of own power than it produced in their behavior.

It is concluded that it is useful to consider the development of social interaction as a feedback process. The evidence also supports the validity of a conception of social power in terms of interpersonal resources.

137 pages. \$1.71. MicA 55-2230

# A STUDY OF PHENOMENAL RESOLUTION OF EXPERIMENTALLY INDUCED STRAIN IN COGNITIVE STRUCTURES

(Publication No. 12,614)

Joseph Edward McGrath, Ph.D.  
University of Michigan, 1955

The chief aim of this study was to make an experimental test of two hypotheses from Newcomb's theory of communicative acts:

1. There is a tendency for individuals to perceive agreement with other persons regarded as attractive, with respect to objects of common relevance to those individuals, and to perceive disagreement about such objects with persons regarded as "negatively" attractive.
2. If information is received about the others' attitudes which conflicts with previous perceptions of those attitudes, there will be a tendency for other changes to occur in the phenomenal field which will maintain equilibrium, as described in hypothesis one.

A secondary aim of this study was to explore some of the conditions under which various types of such equilibrium-maintaining changes occur.

Student subjects were asked to state their attitudes toward a series of contemporary political figures and toward a number of contemporary political issues, being permitted to accept any number of four alternatives in attitude toward the political issues. They were also asked to estimate each political figure's attitude on each political issue. These responses were analyzed in order to construct a body of information about purported attitudes of the political figures on two of the political issues which would contradict a maximum number of the estimates previously made by the subjects. This information was presented, as the experimental influence, to a number of the subjects who had completed the previous questionnaires. A similar set of post-experimental responses was obtained from them regarding those two political issues and two other political issues on which no information was given. Thirty-two experimental subjects completed both Pre- and Post-experimental questionnaires. Their responses with regard to seven political figures, in reference to these four political issues, constitute the data upon which analyses were based.

Each combination of a subject's attitude toward a political issue, attitude toward a politician, and estimate of that politician's attitude toward that issue, was treated as a system. Such systems were taken as unit cases for analysis procedures.

Analyses were performed to test the two hypotheses stated above, using several operational definitions of each

of the major theoretical variables considered. Results of these analyses strongly supported both of the two major hypotheses of this study, in most cases at less than the .001 level of probability.

Further exploratory analyses yielded a number of suggestive findings concerning the conditions under which various types of equilibrium-maintaining changes occurred. The chief conclusions of this study are:

1. There is strong evidence of a tendency for perception of agreement with positively attractive others about attitude objects, and disagreement about them with negatively attractive others; and for the persistence of such patterns over time, in spite of incoming information which tends to disrupt the equilibrium of these patterns.
2. The most frequent type of change occurring to offset the disequilibrium-producing effects of the experimental information was a re-definition of what constitutes agreement on the given political issue. That is, most subjects came to accept a wider range of positions on the political issues after the receipt of the experimental information than they had before. The least frequent type of change appeared to be changes in attraction for the other.

Some implications of these findings for Newcomb's theory of communicative acts were considered, and that theory was evaluated as a general approach to the study of social psychological phenomena.

221 pages. \$2.76. MicA 55-2231

# COMMUNICATION, CONSENSUS AND INTERPERSONAL ATTRACTION

(Publication No. 12,619)

Glen Davison Mellinger, Ph.D.  
University of Michigan, 1955

This study tests hypotheses derived from a set of assumptions (most explicitly formulated by Newcomb). According to these assumptions, the attitudes of two communicators toward each other, together with their orientations toward objects or issues of common concern, comprise a system within which certain definable relationships exist. This study investigates these relationships, using attitude survey methods in a large-scale organization.

The study population is composed of professional scientists engaged in medical research in a government agency. The data were obtained by means of a paper-and-pencil questionnaire. One section of the questionnaire consisted of a modified sociometric instrument designed to obtain attitudes toward specific colleagues. Interpersonal attitudes were measured along two attraction dimensions: liking and trust. Each respondent also was asked (1) to express his opinion about a particular important issue, (2) to indicate whether he had discussed this issue with each colleague named earlier, and (3) to estimate how each of these others had answered the same question. The procedure made it possible to match the reciprocated responses of a perceiver (S) with those of a perceived other (O).

As regards objective consensus (or agreement), we

find a moderately significant positive relationship between agreement, on the one hand, and both communication and mutual liking, on the other. As predicted, the relationship between communication and agreement disappears under conditions of mutual low liking; and the relationship between liking and agreement disappears in the absence of communication. Less conclusive findings are obtained when trust is substituted for liking.

The findings for perceived consensus may be described in terms of S's accuracy in estimating O's opinion. We find that Ss who have communicated with O about the issue are more accurate than Ss who have not when:

1. S's liking for O is mild or neutral, or
2. O's trust in S is high.

However, there is no consistent relationship between communication and accuracy when:

3. S's liking for O is high, or
4. O's trust in S is low.

Findings (1) and (3) are consistent with the assumption that high liking for another person (as contrasted with mild liking or neutrality) predisposes an individual to distort information about the other's opinion in the direction of perceived similarity. In the case of actual disagreement, this gives rise to inaccurate perceptions. Findings (2) and (4) appear to support the contention that lack of trust in another person predisposes an individual to communicate, if at all, in such a way as to conceal his private opinions. The accuracy of the other's perceptions are impaired accordingly.

205 pages. \$2.56. MicA 55-2232

#### THE EFFECTS OF INVOLVEMENT IN A PURCHASE DECISION ON ATTITUDES TOWARD AUTOMOBILES

(Publication No. 12,620)

David Freeland Miller, Ph.D.  
University of Michigan, 1955

The study was conducted to explore the relationship between involvement in a decision and attitudes toward the object of the decision. The particular decision under observation concerned the purchase of a new automobile. Members of a 10,000-family car owner panel were asked by postcard to indicate their distance from purchase of a new automobile. Follow-up questionnaires were sent to all adult members of 594 families who planned to buy within six months, 200 families planning to buy between 6 and 24 months, and 200 families who did not plan to buy for two years or more. After a six-month interval an identical set of questionnaires was sent to the same families.

Each respondent was classified according to amount of involvement in the purchase. Involvement was defined operationally in terms of two dimensions: purchase expectations and responsibility for the purchase decision. The first was measured by the reply to the initial post card; the second, by each individual's evaluation of his role in past and future car purchases. Each dimension had three levels; thus there were nine involvement groups. A person was considered to be maximally involved if his family was immediately in the market for a new automobile and he

considered himself chiefly responsible for the purchase decision (i.e. was "gatekeeper" for the family).

The two major hypotheses pertained to the relationship between involvement in a decision and attitudes. One hypothesis predicted that the distribution of attitudes of involved persons would differ significantly from those of uninvolved persons. There was little confirmation in the study for this hypothesis. The second hypothesis concerned the effect of involvement on the congruity of attitudes. The major prediction stemming from this hypothesis was that a person who is highly involved in a car-purchasing situation would be more likely than one who is uninvolved, to ascribe high-valenced characteristics to the make of his choice and conversely, less likely to ascribe high-valenced characteristics to rejected makes. There was considerable evidence to support this hypothesis, although some data appeared to be partially in conflict with it.

One chapter is devoted to the validation of consumer expectations through actual purchase behavior. Only 44 percent of families intending to buy within six months followed through on schedule. In those families which did buy, there was considerable disparity between preferred make, as recorded on the first questionnaire, and purchased make, as reported six months later. The votes of gatekeepers were better predictors of make actually bought, than those of non-gatekeepers; yet only 64 percent of gatekeepers correctly named the make of automobile later purchased.

The primary conclusion of the study is that involvement in a decision creates within the individual a pressure toward attitudinal congruity. The effect of this congruity is to reinforce present attitudes and to make them more resistant to change.

147 pages. \$1.84. MicA 55-2233

#### TOWARD AN INSTRUMENT TO IDENTIFY AND MEASURE THE SELF, SIGNIFICANT OTHERS, AND ALCOHOL IN THE SYMBOLIC ENVIRONMENT: AN EMPIRICAL STUDY

(Publication No. 12,911)

Harold A. Mulford, Jr., Ph.D.  
State University of Iowa, 1955

Chairman: Professor Manfred H. Kuhn

This research seeks to develop an instrument to identify and measure certain variables in order to test the general hypothesis that one's definitions of social objects are lawfully organized, and that central to this larger system of definitions is a system of self definitions that guides behavior. The study focuses on possible interrelationships among these phenomena: 1) subject's definitions of himself, 2) his conception of significant others' definitions of him, 3) his definitions of alcoholic beverages, and 4) a behavior criterion, the subject's use of alcohol.

#### THEORY

A "symbolic interaction" theory guided the study. It may be traced back through G. H. Mead to Cooley, Baldwin



and James, and it also draws on the works of the semanticist, Alfred Korzybski, the psychiatrist H. S. Sullivan, and the Operational Philosophy of Anatol Rapoport. The basic concepts are formulated out of the symbolic activity, and not the physiology, of the human organism, and it assumes human behavior is unique to man.

Three hypotheses were tested empirically: 1) the self is a lawfully organized system of definitions, 2) definitions of self are lawfully related to definitions of alcohol, and 3) definitions of self, definitions of alcohol, and other behavior toward alcohol are lawfully interrelated. The hypotheses were tested by Chi square tests for association among these variables: (1) written statements defining self, (2) degrees of satisfaction with stated self definitions, (3) conception of significant others' definitions of self, (4) degrees of agreement with significant others' definitions of self, (5) definitions of alcohol as a means of adjustment, (6) quantity-frequency index of alcohol consumption.

### OPERATIONS

An instrument was devised to obtain appropriate written statements. These were categorized to serve as measures of the variables enumerated above. Variable (1) was obtained from statements answering the question, "Who Am I?" (2) was obtained from statements of degree of satisfaction with self definitions. Each respondent was asked to list significant others — persons whose judgments of himself are important to him — as an intermediate step in obtaining variable (3) which was then obtained from statements completing the stem, "They think I am . . ." (4) was obtained from statements of degree of agreement with others' definitions of self. (5) was obtained from statements completing the stem, "Alcohol is . . ." (6) was obtained from responses to direct questions.

There were three groups of respondents: 1) college students, 2) "inebriate" patients in mental hospitals, and 3) members of the Sertoma Club combined with some teachers.

### FINDINGS AND CONCLUSIONS

Hypothesis I found support in association between self satisfaction and agreement with others' definitions of self for the student group. (No such association was found for the other two groups).

Hypothesis II found support in the negative association between self satisfaction and number of definitions of alcohol as a means of adjustment for the student group. (No similar association for the other two groups.); and, for patients, agreement with others' definitions of self was negatively associated with number of definitions of alcohol as a means of adjustment. (No such association for the other two groups).

Support for hypothesis III lies in: 1) the fact of drinking was associated with number of definitions of alcohol as a means of adjustment. 2) 29 percent of student drinkers had all of these: low self satisfaction, low agreement with others' definitions of self, few "anchorages," larger number of definitions of alcohol as a means of adjustment; and 85 percent of these persons had a high Q-F index. Not one student drinker had in combination the opposites of all

these measures. There was a similar finding on the Sertoma-teachers group.

The association between variables in only certain cases suggests that refinement might render the instrument of practical value in identifying, for example, potential "alcoholics," drinkers receptive to Alcoholics Anonymous, or placebo reactors.

129 pages. \$1.61. MicA 55-2234

### THE SELF AND OTHER OBJECTS: THEIR MEASUREMENT AND INTERRELATIONSHIPS

(Publication No. 12,926)

Robert Leroy Stewart, Ph.D.  
State University of Iowa, 1955

Chairman: Professor Manford H. Kuhn

This dissertation is a report of a research project carried out under the general orientation of self theory. More particularly, this project follows the recent Meadian views and empirical emphasis of Manford Kuhn and Thomas McPartland.

Briefly, this is the theoretical orientation. Self views are interrelated, organized, and relevant to all behavioral situations. These views are significant due to the unique characteristic of the self: it is the only object which is involved in every social situation; it is the omnipresent characteristic of the self that makes it crucial in the analysis of human social behavior; and, at least in theory, behavior always demands that the individual take account of himself in relation to the object of behavior.

Two of the basic postulates of this orientation are the following: (1) there is a high degree of relationship between self views and the objects toward which behavior is directed; and (2) self views and the objects toward which behavior is directed are derived from significant others. These postulates are put to an empirical test in this research.

There are three basic variables in this orientation for which empirical observations are necessary. These are: the self, other objects, and significant others. The Kuhn-McPartland "Twenty Statements Test" was used as the device for observing the self. This test, although of recent development, has had considerable use, all of which has provided evidence of its reliability validity, and predictive-ness.

The other objects variable was observed on the basis of an instrument referred to as the Objects Test. This test asks the respondent to give twenty different statements in answer to the question they address to themselves, "What is Important to Me?" This instrument has not been administered other than in this project.

The third variable, significant others, was observed by the use of another open-ended question. The respondent was asked to make fifteen responses to the instruction to "list those persons and groups of persons to whom you refer yourself, either directly or in your thinking, when confronted with a problem, or in order to support or justify your actions." The individuals or groups which are listed on this test are taken to be the others which provide the

respondent with the identity and meaning of his objects, self and other.

The hypothesis of this research is the following: high degrees of association obtain between statements which appear on each of these tests. This hypothesis was tested by noting the appearance of related references on each of the three tests falling into the following categories: occupation, religion, education, parental family, and marital family.

The test of the association between occupational identification and related occupational objects yielded a Chi square of 30.10, significant beyond the .001 level of confidence. This indicated that if occupation is mentioned in self identification, it is most likely that objects related to occupation will be mentioned on the Objects Test. It was also indicated that if there is no self identification in terms of occupation, that it is most likely there will be no mention of objects related to occupation.

The same general pattern was observed with respect to the other tests made in the various categories of mention. The lowest association observed in this regard was between self identification in terms of parental family and references to parental family members as significant others. This test yielded a Chi square of 1.37 which is not significant. All other tests of association were significant beyond the .05 level. The highest association obtained as indicated by Chi square was 87.24, significant beyond the .001 level. This association was observed between self identification in terms of marital family and references to objects related to the marital family.

On the basis of this study it can be said that statistically significant associations have been observed between the three variables defined in terms of the Twenty Statements Test, the Objects Test, and the Significant Others Test. These observed associations are significant in that they support the hypothesis that the self, other objects, and significant others are systematically interrelated.

147 pages. \$1.84. MicA 55-2235

REFERENCE GROUPS AND STATUS  
VALUES AS DETERMINANTS OF BEHAVIOR:  
A STUDY OF WOMEN'S VOLUNTARY  
ASSOCIATION BEHAVIOR

(Publication No. 12,930)

Jean Beattie Tompkins, Ph.D.  
State University of Iowa, 1955

Chairman: Harold W. Saunders

This is an exploratory study designed to delineate the functions of women's voluntary-association behavior and to test certain assumptions of reference-group and self-theory as to determinants of behavior.

It is assumed that behavior will depend upon: (1) the possibility for such behavior offered by the cultural context; and (2) the individual's standards and aspirations in regard to role-playing in the reference groups in which his status is most valued by society and most crucial to his self-concept.

The cultural context for the voluntary-association behavior of individuals was examined. Census data as to

institutional statuses occupied by women and roles played in connection with the statuses since 1860, and a list of national women's voluntary associations organized since 1860 were used. Chronological comparison was made of the quantitative change in institutional-status occupancy by American women and of institutional role-types played by women with the origination or increase in specific categories of associations. The latter were categorized on the basis of the institutional aspects of their major stated purposes and activities into nine major categories. On the basis of their criteria for membership they were subcategorized into forty-six types. It was established on the basis of successful recruitment that: (1) the institutional status of married woman was the most socially valued; and (2) those associations which had the longest existence and the greatest membership were related to that status — specifically to the role of wife and mother, especially to its socializing aspect.

Behavior of individual women was examined from the point of view of reference-group and self-theory, using data obtained from structural interviews with a systematic random sample of women in Iowa City, Iowa.

Respondents were categorized in terms of a reproduction-work ratio into six familial role-types, based on Kirkpatrick's definitions. They were categorized as to type of self-concept held on the basis of their locus scale-type, as determined by the Twenty Statements Test. Hypotheses as to differential voluntary-association behavior of women in terms of the statuses they occupy) in both institutions and groups), the types of role played, and their self-concepts were tested by three indices; number and type of association memberships held and references used for belonging.

The findings suggested that:

1. Women who occupy different stages in the family-cycle or who play different family type-roles belong to different types of associations and use different references for belonging. Types of associations are seen as related in social function to the same institutional or primary group areas as the reference person or groups which determined membership.

2. Voluntary associations are conceived as instrumental in facilitating role-playing. Women belong to the associations for the purposes of maintaining or improving their concepts-of-self in terms of the values accorded certain role-behavior by society, transmitted to them by the reference groups to which they relate themselves.

3. Role-behavior in a family status is the most frequent institutional-status reason given for belonging; friends are the most frequent intermediary for the affiliation.

4. Associations may become reference groups for behavior of the members and values of associations may modify or reinforce role-definitions so as to bring role-behavior in line with the standards of the reference groups in which status is most valued. Or, they may be matrices for groups of women who play like role-types and who through interaction on the basis of "friendship" become reference groups for members.

5. "Most valued status" may change through time and space. Such change tends to be reflected in the voluntary association behavior of women.

6. Incidence of different types of association memberships is proportionate to the opportunities for such membership provided by the social context.

229 pages. \$2.86. MicA 55-2236



## SOCIOLOGY

### SOCIOLOGY, GENERAL

#### THE SUBURBANIZATION OF SERVICE TRADE ACTIVITIES IN STANDARD METROPOLITAN AREAS OF THE UNITED STATES FROM 1939 TO 1948

(Publication No. 13,323)

Ray Paul Cuzzort, Ph.D.  
University of Minnesota, 1955

Adviser: Professor Roy Francis

This study set out to determine the possible association between the population characteristics of the suburbs of metropolitan communities and the pattern of distribution of a little studied type of economic activity — the service trade industries. The study relied heavily on the technique of multiple regression analysis using a sample of 125 of the principal standard metropolitan areas of the United States. It was argued that traditional measures of central tendency so often employed in demographic studies are capable of serving only a general descriptive function. Such measures do not give any indication of the extent to which certain individual cases deviate, and they do not provide any sort of explanatory statement that refers to variation among individual cases.

Data were examined for total services and for personal, business, auto repair, and miscellaneous repair services. These industries were examined to determine the variation among standard metropolitan areas with respect to the percent of total metropolitan service receipts made by establishments located in the suburbs in 1948. The data were further examined with respect to changes in service activity that had taken place in the suburban areas between the years 1939 and 1948. Seventeen different measures of service activity were obtained and analysed as dependent variables.

An attempt was made to explain variations in the dependent variables on the basis of sixteen different demographic measures. It was found that the degree of suburbanization of service industry was more amenable to a sound statistical and theoretically relevant explanation than were measures of change in service activity.

It was determined that variation among standard metropolitan areas in the percent of total service receipts in the ring was associated with the percent of population in the ring, the percent of population in the rural part of the ring, and the median family income for the S.M.A. Eight of the sixteen demographic factors, when incorporated into a multiple regression equation, were capable of explaining 84 percent of the variation in the percent of total service receipts in the ring in 1948.

Change in service activity in both the suburban and central city areas proved more difficult to explain on the basis of demographic changes. When regional variations were taken into account, demographic variables were capable of explaining about 42 percent of the variation in change in

service activity in the suburbs. It was hypothesized that this low proportion of explained variation might be due to a lag between the demographic development and the economic development of an area within a metropolis.

270 pages. \$3.38. MicA 55-2237

#### A SOCIOLOGICAL STUDY OF THE RELATIONSHIPS BETWEEN MAN AND THE LAND IN THE DEPARTMENT OF BOYACÁ, COLOMBIA

(Publication No. 12,770)

Orlando Fals-Borda, Ph.D.  
The University of Florida, 1955

This dissertation is the result of an attempt to apply the scientific method in the study of the institutional relationships between man and the land in the department of Boyacá, Republic of Colombia. As such it presents facts, descriptions, and analyses bearing on social realities encountered in that department. Primary attention is given to setting forth the nature of these man-land relationships as they prevail at the present time, but every effort has been made to determine the nature of the changes and trends that have taken place since the first settlements of Europeans were made in the area. Three introductory chapters furnish information on the scope and definitions of the study, a survey of pertinent literature, the physical and the historical backgrounds, and the population of Boyacá.

The scattered farmsteads type is the predominant pattern of settlement in Boyacá. Archival investigation shows that this pattern has been predominant here since colonial and pre-conquest days. The Chibcha Indians who first occupied this territory were settled in scattered farmsteads, and the Spaniards' attempts to assemble the Indians into villages failed.

The land has been divided according to a highly inefficient system by using metes and bounds as boundaries. This indefinite, impermanent, and indeterminate system has fostered endless conflicts and litigation. No definite plan has been adopted for the survey of unpatented lands.

Ownership in fee simple is the predominant tenurial pattern in Boyacá. Only marginal areas show a proportion of owners which is considerably below the average for the department. However, the local owners and operators are handicapped by the very small size of their farms. There has been in Boyacá a noted trend from a domination by the large holding to the prevalence of the small one. This process started to develop fully at the time when Indian reservations were terminated in the eighteenth and nineteenth centuries. Statistical studies show that minifundia and fincas predominate in many areas of this department.

The ecological situation is complicated by fragmentation of holdings. This phenomenon is related to fee simple

tenure, egalitarian inheritance, and purchases of land which are dictated by a desire to invest and to secure soils of different kinds and at different altitudes. Fragmentation appears to be an asset to farms located on the rugged terrain of this department. Quantitative studies and statistical analyses illustrate this phenomenon as it appears in diverse areas in Boyacá.

From the standpoint of the manner in which the farmers extract a living from the soil, Boyacá is in the hoe culture and rudimentary plow culture stages. Remnants of fire agriculture and tools and techniques from Indian times can still be observed. Mechanization has just begun.

The locality group structure is increasingly fluid. There is a definite trend from the atomization of communities prevalent in the nineteenth century to an incipient integration of them. The neighborhood is the most important and the most easily recognizable locality group. However, the society now is moving from *Gemeinschaft* to *Gesellschaft*, from an "incoherent homogeneity" to a "coherent heterogeneity." The creation of a heavy steel industry in the department and the construction of roads and railways are bringing about rapid changes in the societal structure.

One of the main purposes of this dissertation is to furnish social scientists and social planners with an objective picture of the local reality. The socio-ecological characteristics of Boyacá have been considered highly significant, as the relationships of man to the land in this department furnish the all-embracing ethos for the group. A study of these relationships comes very close to being an adequate analysis of the very foundations of Boyacá's society. Because this group — the quintessence of Columbia — is representative of many other agricultural-pastoral societies in Latin America, where similar cultural traditions have prevailed, the present study may serve as an indicator of what may be encountered elsewhere. The methodology introduced might be employed with success in the analysis of other rural worlds south of the border.

277 pages. \$3.46. Mic 55-203

#### FERTILITY AND MORTALITY IN THE ROCKY MOUNTAIN WEST

(Publication No. 13,083)

Edwin Gilbert Flittie, Ph.D.  
Northwestern University, 1955

Adviser: Wendell Bell

**The Problem** The purpose of the study was to determine the influences of urbanism and socio-economic status upon fertility and mortality for a population type represented by the counties of the Rocky Mountain West in 1940 by testing the following four hypotheses:

- (1) The greater the urbanism the lower the fertility.
- (2) The greater the urbanism the lower the mortality.
- (3) The higher the level of socio-economic status the lower the fertility.
- (4) The higher the level of socio-economic status the lower the mortality.

**The Delineation of the Rocky Mountain West** Using an original delineation technique based upon cultural and

physiographic characteristics, seventy-nine contiguous counties in Colorado, Idaho, Montana, Washington and Wyoming were delimited as the Rocky Mountain West.

#### **The Indexes of Urbanism and Socio-Economic Status**

From data describing the extent of urbanism and socio-economic level of the populations of the counties, indexes of urbanism and socio-economic status were computed for each county.

**The Indexes of Fertility and Mortality** A standardized birth rate, standardized death rate and infant mortality rate were computed for each county, using vital statistics data and population data. The standardized birth rates and standardized death rates were based upon the white population of the United States for 1940, which was standardized for age and sex.

**The Techniques of Analysis** The comparative method was employed in relating the indexes of urbanism and socio-economic status to the indexes of fertility and mortality, by using the following techniques of analysis: (a) predicted and observed correlations; (b) simple cross-classification; (c) index correlation; (d) simultaneous cross-classification; and (e) partial correlation. Since the counties were conceived of as being a finite universe, no tests of significance were employed.

**The Findings** The execution of the research design resulted in the following findings:

- (1) An inverse relationship existed between urbanism and fertility, thus verifying the first hypothesis. This inverse relationship was somewhat reduced when the influence of socio-economic status was taken into account.
- (2) There was evidence of a small direct relationship between urbanism and mortality as measured by the standardized death rate, thus failing to support the second hypothesis. When socio-economic status was taken into consideration, the small direct relationship disappeared.
- (3) A limited direct relationship, contrary to the second hypothesis, obtained between urbanism and mortality as determined by the infant mortality rate. This direct relationship was substantially increased when the influence of socio-economic status was considered.
- (4) The third hypothesis was upheld, inasmuch as an inverse relationship obtained between socio-economic status and fertility. This inverse relationship was considerably reduced when the effect of urbanism was controlled.
- (5) The relationship of socio-economic status and mortality, as measured by the standardized death rate, failed to support the fourth hypothesis, because a small direct relationship was observed between these variables. When urbanism was taken into account this direct relationship disappeared.
- (6) An inverse relationship held between socio-economic status and mortality, as determined by the infant mortality rate, thus verifying the fourth hypothesis. The magnitude of the inverse relationship increased when the influence of urbanism was controlled.

**Conclusions** In spite of the unique aspects of urbanism and socio-economic status in the counties of the Rocky Mountain West, the influence of these factors upon fertility and mortality in the counties of the area were found to be



virtually identical to those which have been observed for other populations.

188 pages. \$2.35. MicA 55-2238

# RELATIONSHIP BETWEEN SOCIO-ECONOMIC STATUS AND CHOICE OF SECONDARY SCHOOL

(Publication No. 12,808)

Vernon Christ Pohlmann, Ph.D.  
Washington University, 1955

Chairman: Dr. Ralph C. Patrick, Jr.

## The Problem:

It is generally assumed that our educational system fosters social mobility; however, various studies demonstrate certain limitations upon this process. As one facet of this problem we hypothesize that a basic factor in the choice of secondary school is the socio-economic status of a child's family.

The focus of the study is on the public technical and general high schools. However, a major portion of the study includes all types of secondary schools.

## Sample:

The data are based on a ten percent sample of white residents of the City of St. Louis who completed the eighth grade of public and parochial schools in June, 1953, plus a separately analyzed group of students in private schools.

## Methodology:

The data for the study are from questionnaires and school records. The questionnaires indicate the reasons for choice between technical and general high schools as stated by teachers and students. The school records provide information on factors related to actual school choice. The relationship is analyzed first by the methods of contingency and chi square, from which it is possible to eliminate certain factors and combine others. The final analysis is based on the method of covariance.

## Findings:

On the questionnaires elementary principals, eighth grade teachers, and ninth grade students say that parental influence and the kind of courses offered are among the most important reasons for choosing between technical and general high schools. The importance of socio-economic factors can be inferred only indirectly from these replies.

The factors studied as related to actual choice of school are sex, age, I.Q., reading ability, rank in the eighth grade, distance from home to school, and socio-economic status. The latter item is based on the father's occupation and census housing data for the block where the child lives. A preliminary analysis indicates that there is a statistically significant relationship between choice of school and each factor except rank, that age, I.Q., and reading ability can be combined into one index of ability, and that rank and distance can be eliminated from further consideration.

A final analysis of boys and girls separately by the method of covariance reveals that socio-economic status is a basic factor in the choice of secondary school, whereas ability is generally less significantly related. However, ability appears to be a more significant factor than socio-economic status in regard to choice between the technical and general high schools. The probability of the null hypothesis that there is no difference between each type of school is as follows:

School Types	Socio-Economic Status (Ability Constant)		Ability Index (Socio-Economic Status Constant)	
	Boys	Girls	Boys	Girls
Non-School vs. Public Technical	<0.01	<0.05	<0.01	>0.05
Public Technical vs. Parochial and Public General	<0.01	>0.05	<0.001	<0.01
Parochial vs. Public General	>0.05	>0.05	>0.05	>0.05
Parochial and Public General vs. Private Parochial	<0.02	<0.001	<0.001	>0.05
Parochial and Public General vs. Private	(Not computed Assumed <0.001)		>0.05	>0.05
Private Parochial vs. Private	<0.001	<0.001	<0.05	<0.001
Over-all (Excluding Non-School Groups)	<0.001	<0.001	<0.001	=0.05

## Conclusion:

On the basis of a study of ninth grade students in St. Louis, we conclude that choice of secondary school is related to a student's socio-economic status, although ability tends to be more important in choice between technical and general high schools.

139 pages. \$1.74. MicA 55-2239

A RHETORICAL ANALYSIS OF THE  
PUBLIC SPEAKING OF FLOYD B. OLSON

(Publication No. 13,316)

Kenneth Luther Berger, Ph.D.  
University of Minnesota, 1955

Floyd B. Olson was the Farmer-Labor governor of Minnesota from 1930 to 1936. This study was concerned with a rhetorical analysis of one hundred and eighteen of his speeches. The specific objectives of the research were: 1. To examine the possible effects of Floyd Olson's early experiences and education on his public speaking. 2. To determine the part played by his public speaking in the political success he enjoyed. 3. To determine his contributions to society as reflected in his addresses on various public issues. 4. To evaluate the persuasive value of the natural endowment the Governor carried into each speaking situation. 5. To investigate the nature of the state audience he addressed in terms of their economic and political predispositions created by the depression. 6. To analyze the persuasion used by Olson in presenting his ideas, in proposing their acceptance, and in meeting their opposition.

To fulfill the purposes of this research the following chapters were developed.

Chapter II is concerned with Olson's life and early training as it affected his public speaking. The speaker's personal resources are inventoried in the third chapter. The dual topics of delivery and style are considered in the fourth. Chapter five, The Setting of Olson's Speeches, is concerned with the state and the national economic conditions that helped to determine the thinking and the action sets of the people whom he addressed. Chapter VI presents the Production for Use concept which Olson advanced and defended. Chapter VII considers the Governor's logical defense of his ideas. The eighth chapter is concerned with Olson's use of seven propositions designed to unify the Farmer-Labor party. Chapter nine exposes the Governor's defense of his ethos.

The following conclusions might be drawn from the discussion of the foregoing chapters.

Though Olson's political enemies often disliked his program, they admitted that as a political orator he had few peers. His speaking ability contributed to the leadership he gained in the Party, the state and the nation.

Because the Governor's personality harbored incongruous elements, he presented an attractive public image. He spoke lightly of the importance of money, and meant it! In conversation his language was often earthy and spotted with slang; in public his vocabulary and choice of idiom was above criticism. Olson's natural endowment was a compelling factor in the advantageous platform reception he received and in the political successes he enjoyed.

Olson created his legislative, campaign and occasional speeches. Factual information for all of the addresses was provided by workers in his office or by experts. The

Governor spoke extemporaneously most of the time, relying on neither manuscript nor notes. His platform deportment ranged from a quiet conversational style to a vigorous presentation of his material.

Governor Olson delivered his speeches to a people who were ripe for an economic change. He took advantage of it by indicting capitalism primarily because it required that a profit be made, a factor that militated against the producer and consumer getting together particularly in depression times. He offered in its place an inadequately developed Production for Use concept based in part on placing a ceiling on income and on expanding producer and consumer cooperatives. Olson insisted that a new third party, led by the Minnesota Farmer-Labor party was needed to sell his new economic concept.

Defense of the Governor's Production for Use idea was concentrated in an implicative system arranged to demonstrate that under capitalism the emphasis was on property at the expense of people, whereas under his program the reverse would be true.

Inasmuch as it was imperative that the Farmer-Labor party stay in office if this program were to be adopted, Olson spent much of his time defending his reputation and trying to develop unity within the party.

363 pages. \$4.54. MicA 55-2240

THE FACTOR OF RELEVANCE IN THE  
SERIAL REPRODUCTION OF INFORMATION

(Publication No. 12,882)

Forrest L. Brissey, Ph.D.  
State University of Iowa, 1955

Co-chairmen: Associate Professor Earl D. Schubert  
Professor Wendell Johnson

The method of serial reproduction was employed in an evaluation of the accuracy with which information might be communicated from one individual to another. Information was defined as a set of one or more true, factual statements pertinent to a specified event and relevant to a specified question.

A motion picture was used as the specified event with regard to which five groups, each composed of thirty-four subjects, were required to communicate. The subjects of the first (eye-witness) group, after observing the film, were instructed to write an account of the story told. These accounts were then randomly distributed (one to each) among the subjects of the second group. The subjects of this group were instructed to read the group one account, and then to write their own version. The accounts written by the subjects of group two were used as material for group three, and so on through the fifth group. The



same instruction-induced relevance set was provided for each subject.

The effectiveness of the communication was evaluated in terms of responses made by the participating subjects to a criterion test. The test items pertained to the events depicted in the motion picture. In a preliminary investigation each of the items were scaled for relevance by the method of equal-appearing intervals. The relevance judgments were made in accordance with the same relevance set provided for the subjects participating in the main investigation.

Three text response categories were employed in the evaluation: (1) true test items correct (informed); (2) true test items incorrect (misinformed); (3) true test items omitted (uninformed). The test items were weighted for relevance, and the score employed in each category was the sum of the weighted items. The observed differences between group means for weighted score and relevance value in the above categories were evaluated statistically by the analysis of variance technique. The mean number of words produced by each group and the relative degree to which the groups were informed with regard to the "most important" message were also studied.

Under the conditions of this study, and for the subjects and material employed, the results of the analyses provide support for the following conclusions:

(1) Statements may be reliably and usefully scaled on a continuum of relevance by the method of equal-appearing intervals.

(2) Serial reproduction is associated with a progressive decline in the degree to which the successive groups are informed; however, the relevance value of the retained information tends to remain at approximately the same, moderately high value for all groups except the eye-witness group.

(3) The eye-witness group is the best informed, least misinformed, and least uninformed of the five groups.

(4) All groups are relatively more informed than misinformed in terms of both the amount and relevance value of the information possessed.

(5) Successive groups are progressively more uninformed than misinformed as serial reproduction proceeds.

(6) the amount of material produced progressively declines to approximately one-fourth of the amount of material produced by the eye-witness group.

(7) The relative degree to which the successive groups are informed with regard to the "most important" message declines from approximately ninety-four per cent of the message for group one to approximately thirty per cent of the message for group five.

155 pages. \$1.94. MicA 55-2241

#### A STUDY OF THE LOCI OF STUTTERING IN SPONTANEOUS SPEECH

(Publication No. 13,090)

Robert Frank Hejna, Ph.D.  
Northwestern University, 1955

This study was designed to assess stuttering occurrence during spontaneous speech to determine whether certain loci could be observed in the speech sequence. Stuttering

incidence was investigated as it related to the factors of grammatical function, word length, word position, accent and phonetic values. Previous studies had dealt largely with measurement of stuttering phenomena under conditions of oral reading. It was the aim of this study to extend in a systematic manner the findings of the earlier studies so as to afford a greater descriptive accuracy and understanding of stuttering behavior.

Eighteen high school stutterers were used in this investigation. Their spontaneous speech was recorded on magnetic tape and then transcribed for analysis. A total of 17,143 stuttered words were analyzed according to the various categories under analysis. Reliability studies, using the Pearson "r," were done on the classifications in the various categories used. Stuttering incidence as it occurred on particular words, syllables, or phonemes, was compared to total word, syllable, or phoneme occurrence providing obtained versus expected frequencies which were then treated statistically. A non-parametric sign test was used for this purpose. A random sample of 31,156 words, representing approximately 12% of total word usage, was used for the above comparison of obtained and expected frequencies.

The results demonstrated that loci of stuttering were present during spontaneous speech which related to the various factors investigated.

1. A locus of stuttering was observed which was directly related to grammatical function. Significant group trends were observed for more than the expected stuttering on nouns and adjectives and less than the expected stuttering on prepositions, articles, expletives, and interjections. An absence of significant trends was observed on pronouns, verbs, adverbs, and conjunctions.

2. Word length was found to have been related to stuttering incidence. Significant group trends were observed for less than the expected stuttering on two and three letter words and more than the expected stuttering on words of six, eight; nine, ten, and eleven letters. The findings suggested that the grammatical factor may have contributed to this locus of stuttering.

3. A locus of stuttering was observed with respect to word position. Significant group trends were observed for more than the expected stuttering on words in the 2nd, 3rd, 4th, 6th, and 7th positions and less than the expected stuttering on words in positions beyond the 15th. An absence of significant group trends was observed for words in the 1st, 5th, and 8th-15th positions.

4. A relationship between stuttering incidence and phonetic values was indicated by the findings. A significant group trend was observed for more than the expected stuttering on total consonants and less than the expected stuttering on total vowels. Almost all stuttering was found to have occurred in the initial position. Trends were not as clearly apparent when phonemes were considered individually. The data suggested that the grammatical factor may have contributed to this locus of stuttering.

5. A direct relationship was found to have existed between stuttering incidence and accent value of syllables. A significant group trend was observed for more than the expected stuttering on accented syllables and less than the expected stuttering on unaccented syllables in both initial and other than initial position of polysyllabic words. It was hypothesized that the grammatical factor may have acted in combination with the accent factor in contributing to this locus of stuttering.

The loci of stuttering observed in this study justify rejection of the hypothesis that stuttering occurs randomly during spontaneous speech. The findings are in agreement with the notion that stuttering patterns might exist as selective responses to cue or stimulus values of certain words, sounds, or syllables.

178 pages. \$2.23. MicA 55-2242

### AN OBJECTIVE INDEX OF NASALITY

(Publication No. 13,336)

Gordon Morris Low, Ph.D.  
University of Minnesota, 1955

The contradictory evidence in the field of speech as to the relationship between nasality and the intensity of sound emitted from the nose, the considerable evidence that a useful relationship does exist between nasality and nasal sound intensity, the lack of uniformity in the definition of cause and in the classification of different types of nasal voice quality, and the possibility of constructing and combining equipment capable of accurate graphic measurement of nasal and oral sound intensity suggested the following purposes of this investigation:

1. To develop an instrumental technique by which an objective index of nasality could be obtained and which was based on the measurement of intensity of sound emitted from the nose.
2. To obtain new information about the relationship between nasality and nasal sound intensity.
3. To obtain other information which might contribute to an understanding of the cause and classification of several different types of nasal voice quality.

An instrument was designed and constructed by the experimenter and equipment was selected to satisfy the following conditions:

1. Simultaneous graphic recording of intensity of sound emitted from the nose and of sound emitted from the mouth and nose (total speech intensity).
2. Relatively good linearity of response to the frequency range of human voice and to the rapid fluctuations of intensity of continuous speech.
3. Provisions for the subjective and objective analysis of the same speech sample for each subject by:
  - a. permitting relatively natural speech production without interference from nasal plugs or mouthpieces.
  - b. the tape recording of the subject's speech for later subjective analysis.

From the graphic data several indexes of nasal sound intensity were derived. These indexes were tested for their validity as indexes of nasality in an experiment in which eighty-seven subjects participated, forty-nine men and thirty-eight women. Forty-seven of these subjects were selected as having nasal voice quality and forty were selected as having voices relatively free of nasal quality. Only four of the subjects had known organic deviation of the velopharyngeal mechanism.

Each subject read a standard passage at several intensity levels. Graphic recordings were made of his nasal sound and total speech intensity and a tape recording was made of his speech at the same time. Four judges made

ratings of a selected speech sample of each subject as to the degree of deviation from normal nasal resonance and judged the speech sample in separate listening sessions as to the presence of "too much nasal resonance," "denasality," and "stridency." Voices judged to have stridency and too much nasal resonance were considered to have a type of nasal voice quality designated in this study as nasal twang.

On the basis of the subjective judgments four different experimental groups were defined. The correlation between ratings of degree of deviation from normal nasal resonance and the different indexes of nasal sound intensity was determined for each of the four experimental groups. The highest correlation ( $r = .50$ ) was found for the group in which nasality was narrowly defined to exclude denasality and nasal twang and for the nasality index derived from the ratio of nasal to total speech sound intensity. This correlation coefficient was significant well above the .01 level of confidence and was considered to indicate the validity of the objective index of nasality. It was also considered to indicate that a positive relationship exists between nasality and nasal sound intensity.

The results also suggested that denasality is characterized by low intensity of nasally emitted sound and that nasal twang is characterized by stridency and by nasal emission of sound within the normal range of intensity.

268 pages. \$3.35. MicA 55-2243

### EVASIVENESS IN POLITICAL DISCUSSION BROADCASTS DURING THE 1952 ELECTION CAMPAIGN

(Publication No. 12,617)

Ben Clifford Markland, Ph.D.  
University of Michigan, 1955

This study is an investigation of the frequency and types of evasiveness used by participants in twenty-five radio and television discussion programs broadcast between September 7 and November 2, 1952.

Evasiveness in this study is defined as failure to provide direct and specific answers to direct and specific questions. Rhetoricians and logicians have not discussed evasiveness as a broad concept. They have, however, referred to this matter in their discussions of such topics as fallacious argument, irrelevant evidence, equivocation, casuistry and others. The most specific work in this field has been done by the modern logician and psychologist, Robert H. Thouless. In his book *How to Think Straight*, published in 1950 by Simon and Schuster, Thouless listed and described what he called "thirty-four dishonest tricks in argument." The procedure in this study was to detect evasive answers in the broadcasts and to categorize these answers according to the Thouless list.

The analysis practice used in the study was that of noting every evasive answer, without regard for the speakers' motives, and whether the evasion seemed to be intentional or unintentional. In cases where there were elements of two or more of the Thouless "tricks" in a single evasive answer, the Thouless device which seemed to be dominant was listed.

Two methods of testing the validity and reliability of



the analysis procedure were used. In the first method, each of three recognized speech authorities analyzed single discussion scripts and detected nine instances of evasion. The writer, analyzing the same scripts, detected thirteen evasions. In the second method, the writer and a graduate student in speech, working jointly, analyzed three discussion scripts and agreed on the identification and Thouless classification of eight instances of evasion.

The broadcasts analyzed, from tape recordings, were Meet the Press, American Forum of the Air, and Keep Posted.

Two hundred and twenty-one instances of evasion were noted in the twenty-five broadcasts. This was 8.9 instances per program. Of the 221 evasions, 128 were attributed to the twenty-two Republican participants, ninety-three to the twenty-one Democratic participants.

Of the thirty-four "dishonest tricks in argument" discussed by Thouless, five were most commonly noted. These five were "ambiguity, vagueness, or meaninglessness," (forty-eight instances); "extension by contradiction or misrepresentation," (forty-six instances); "false attribution of prejudices or motives," (thirty-four instances); "diversion," (twenty-eight instances), and "appeal to mere authority," (twelve instances). Eight of the Thouless "tricks" were not noted in the broadcasts. The other twenty-one Thouless categories were noted from one to eight times.

Thirty-eight of the 221 instances of evasion occurred while the participants were discussing some aspect of federal taxes, fiscal policy, or the status of the national economy. Other points under discussion during periods of extensive evasiveness were foreign policy, the Korean conflict, campaign fund policies, and corruption in government.

151 pages. \$1.89. MicA 55-2244

**JAMES ROBINSON PLANCHÉ,  
CRAFTSMAN OF EXTRAVAGANZA**

(Publication No. 12,627)

Albert Henry Nadeau, Ph.D.  
University of Michigan, 1955

Though little understood today, the nineteenth century British extravaganza was especially vital to the success of a season and theatre managers habitually spent more money on the production of these holiday after-pieces than on the production of a regular drama. As dramatic author and director of the *mise en scene* from 1830 to 1860, James Robinson Planché was the supreme master of the extravaganza form.

On the basis of forty-four Planché extravaganza scripts (complete with prefaces and footnotes by the author) and the several memoirs, periodicals, and newspapers of the period, this study has been conducted (1) to determine the method and skill of J. R. Planché in extravaganza composition and staging, and (2) in so doing, to discover the fundamental nature of these unique entertainments. The analysis throughout is directed toward the relatively separate areas of extravaganza composition and extravaganza staging.

Planché was an antiquarian of some reputation and his aim in the theatre was to elevate the poor conditions of

scenic excess and play distortion in the drama of his time. In composing an extravaganza this meant an underlying seriousness of over-all attack based on the adaptor's creed of "truth to source." The British pantomimes and burlesques, upon which Planché evolved his extravaganzas, were hastily pieced-together trifles the central attractions of which were the incidental burlesque jokes of the topical reference, the parody, and the pun. In the extravaganzas, Planché attempted to subordinate these incidental elements by refining the language and style and by emphasizing a precise plot structure.

The employment of scenery in this period in a wings, borders, and back-scene arrangement, which allowed for the rapid change of settings in the view of the audience, had fostered an over-use of scenery for the sake of effect rather than to enhance the meaning of the play. In this area Planché attempted to demonstrate the value of scenery in the projection of meaning. In developing new techniques to serve this end, however, his effort, when poorly imitated by other theatre workers, served only to increase the dependence on scenery and thereby on scenery for scenery's sake. Planché's foremost effort in staging reform, however, was in the direction of historical accuracy in costuming, an established underlying principle of staging in the theatre of today.

In terms of theatre history the contributions of James Robinson Planché are three: (1) through his emphasis on precise plotting and a refined treatment of dialogue and song, he paved the way for the achievement of W. S. Gilbert in the Savoy operas; (2) through this same emphasis he continues to exert a salutary influence on the modern-day British pantomime; and (3) his effort to achieve accuracy in costuming is important to the development of the drama as we know it in our time. In his choice of the extravaganza as his primary weapon against the excesses of scenic display, however, he was ultimately largely responsible for an even greater wanton display of scenery for scenery's sake. For this period of excess, the more temperate methods of the "realistic school" were better attuned to the elevation of dramatic standards.

264 pages. \$3.30. MicA 55 2245

**THE PREACHING OF  
BARTON WARREN STONE**

(Publication No. 12,533)

Evan A. Ulrey, Ph.D.  
Louisiana State University, 1955

Supervisor: Professor Waldo W. Braden

Barton Warren Stone was one of the early American preachers who advocated the union of all Christians in one body. He moved successively westward by horse-back through Virginia, North Carolina, Tennessee, Kentucky, Illinois, and Missouri as the frontier expanded westward. He, like other preachers on the frontier, often preached in a clearing on the edge of a forest, in a school house, or, in the older settlements, in log, frame, or brick church houses. In 1804 Stone withdrew from the Presbyterian church and began to organize autonomous congregations of Christians, or Churches of Christ. The movement

resulting from Stone's efforts grew rapidly, and in 1832 united with a similar effort begun in Virginia by Thomas and Alexander Campbell.

This dissertation is a study of Stone's preaching. He was trained for the ministry by David Caldwell. From 1796 until 1834, he served as regular minister for churches in central Kentucky, at Maysville, Georgetown, and Lexington, in addition to those at Cane Ridge and Concord, making occasional tours into Tennessee, Ohio, Indiana, and Illinois.

The method of investigation used in this study was historical and rhetorical. The following libraries were visited to obtain primary materials: Library of Congress, Presbyterian and Reformed Historical Society Library, Disciples of Christ Historical Society Library, Atlantic Christian College Library, Butler University Library, College of the Bible Library, Lexington Public Library, Illinois State Library, and Culver-Stockton College Library. The following libraries supplied additional materials on microfilm: Cincinnati Public Library, Presbyterian Historical Society of Philadelphia, and the Library of the University of Chicago. Contemporary religious periodicals, pamphlets, journals, letters, sermon outlines, and books were the primary sources of materials.

Stone was trained in the theory of sermon preparation and advocated sound practices to his students. He considered the background of the preacher very important, saying that all learning was valuable to the minister. The steps of preparation for preaching which he advanced were, in the order of their importance: study, prayer, and practice. He thought that the speaker should choose his subject with a view to his own ability, to the needs of the audience, and to the object of the speech.

Ethical appeal was a significant factor in Stone's persuasion. He used common sense, acted with tact and moderation, exercised good taste, revealed a broad familiarity with the issues of his day, and demonstrated wisdom and integrity in handling his materials. Additional factors in his ethical appeal were his personal appearance and his reputation. Emotional appeals were used in order to gain a desired response. However, when he attempted to excite an emotion, he was careful to first make a clear presentation of argument. The use of logical appeals consisted of use of the authority of the scriptures, causal inferences, and deduction. The syllogism appears frequently in his sermons.

In delivery, Stone was animated, yet dignified, having as his primary motive the communication of his message. He had a powerful and pleasant voice, which, in combination with the desire and ability to express himself clearly, made for real effectiveness in speaking. The hundreds of converts which he made testify to his preaching prowess. In spite of some limitations, he was an effective speaker. His preaching was the greatest single factor in his leadership of the Christians.

352 pages. \$4.40. MicA 55-2246

# THE DEVELOPMENT OF AN ELECTRONIC LUMINANCE READING LIGHTMETER FOR MONOCHROMATIC TELEVISION APPLICATIONS

(Publication No. 12,932)

Raymond Wilderman, Ph.D.  
State University of Iowa, 1955

Chairman: Assistant Professor Walter S. Dewey

The purpose of this research was to develop a sensitive, stable, sturdy, economical, and accurate electronic luminance reading lightmeter which would fulfill the measurement needs of scenic lighting for monochromatic television.

Commercially available film exposure meters are inadequate for television purposes since they have a wide angle of acceptance, a small meter needle movement to photocell illumination, and a wide spectral response.

Television cameras, due to the bandpass design of their video systems, have a much decreased tolerance of the darkest and lightest objects in their view as compared to optical camera films. Further, the television camera has a narrower spectral response than that of most optical camera films. Thus, a lightmeter to be adequate for use in the television scenic lighting situation must have a spectral response that, as nearly as possible, matches that of the television camera picture tube. Such a meter must also have a small angle of acceptance if it is to provide an accurate measure of the luminances of small areas of high or low illumination and reflection.

Designing such a meter required that a number of inter-related factors such as phototube selection, signal amplification, aperture angle of acceptance, and luminance range of the instrument, had to be considered somewhat simultaneously.

The type 929 high vacuum phototube was selected for use in the instrument since its spectral response most nearly matches that of the image orthicon camera tube and is quite stable.

Since the phototube had a low signal output, it was necessary to have some means of amplification if the instrument was to have a sizable meter needle movement to changes in phototube illumination. The phototube output signal is a D. C. voltage variation, and the amplification of a D. C. signal proved to be impractical. A. C. amplification required that the phototube signal be converted to an alternating voltage. This conversion system was accomplished by use of a circular disk fitted with ten equally spaced circular apertures rotated at 3600 r.p.m.; thus, the incoming beam of light was chopped so that the phototube signal was a sine function. The chopping disk imparted a frequency of 600 cycles to the amplifier. A filter circuit was built into the amplifier, assuring that only signals in this frequency range were indicated by the instrument.

This instrument contains four precision bias loading resistors in a stepped switching arrangement. The phototube signals are passed through a pre-amplifier and filter circuit and then to a power amplifier stage which drives a milliammeter.

Light is admitted to the photocathode by employing television camera lenses as apertures. This system permits a variable angle of acceptance, depending upon the focal lengths of the lens used, from twenty to eight degrees.

This instrument was calibrated by comparing its response for various lens and f-stop positions to that of a



precision laboratory device, the Macbeth Illuminometer. Both the instrument to be calibrated and the Illuminometer viewed a diffused reflecting area provided by a specially constructed variable illuminating source. The instrument responses to various luminances were plotted to indicate linearity. Calibration tables were then established over the linear portion of each curve.

Using the various scales of this instrument in combination with the lens f-stops, it is possible to obtain luminance readings from 0.2 to 35 candles per foot squared.

Tests of this instrument over extended periods indicate that it is highly accurate and that its percentage of accuracy approaches that of the Macbeth Illuminometer.

The instrument is easily operated and provides instantaneous continuous readings. Depending upon the lens being used and the distance from the scene, it is possible to obtain readings over small areas, thus establishing high and low luminances or readings over larger areas to establish average luminance.

153 pages. \$1.91. MicA 55-2247

#### EFFECTS OF INNER EAR PATHOLOGY ON AURAL OVERLOAD

(Publication No. 12,670)

Phillip Alexander Yantis, Ph.D.  
University of Michigan, 1955

The purpose of this study is to compare the differences between the mean thresholds of aural overload of a group of human normal ears and a group of abnormal ears with clinically verified inner ear pathology. The hypothesis tested is that ears with inner ear pathology will become overloaded at a lower intensity level above their own threshold of audibility (and thus demonstrate a narrower dynamic range of linear response) than normal ears.

It has been demonstrated in animal experimentation that the origin of amplitude distortion, or aural overload, is in the auditory sensory epithelium of the inner ear. Recent studies, also on animals, have shown a possible relationship between a reduction in the dynamic range of linear response to pure tones and the presence of an unhealthy condition in the inner ear.

Twenty-one human subjects with various types of hearing losses were given the following tests in a sound-insulated environment: a) a pure tone audiometric examination, both air and bone conduction; b) loudness recruitment tests, when possible, using either or both of the monaural and binaural equal loudness balance techniques; and c) the threshold of aural overload test. The latter procedure was carried out using the "probe-tone" technique, and employing calibrated acoustic equipment. A probe tone, which differs by a few cycles per second from the first aural overtone of the fundamental test tone, is simultaneously introduced into the ear with the test tone. When the fundamental tone (either 1000 or 2000 cycles per second) is loud enough to overload the ear, then the probe tone of approximately the same intensity appears to beat with the subjective octave of the fundamental. The subject hears beats in the background of the fundamental tone. The level at which the subject hears the beats 50% of the time is taken as the threshold of aural overload, and represents the upper extremity of the dynamic range of linear response to pure tones.

The following results were obtained: 1) The mean threshold of aural overload at 1000 cps in 145 normal ears was 52 decibels above each subject's threshold of audibility for this frequency. The mean was 57 db above threshold at 2000 cps for 133 normal ears. 2) Twelve ears having inner ear pathology had a mean overload threshold of 14 db at 1000 cps; the mean was 17 db for 17 ears with this pathology tested at a fundamental frequency of 2000 cps. All of the ears testable for recruitment in this group demonstrated the phenomenon either partially or completely. 3) The difference between the mean thresholds of distortion of the group with inner ear pathology and the normal group was highly significant at both 1000 and 2000 cps. There was no significant lowering of the mean thresholds of aural distortion in a small group of ears with middle ear pathology or retrocochlear (VIIIth nerve) pathology from the normal means.

Two general conclusions can be drawn from the study: 1) A lowered threshold of aural overload (i.e., a restricted dynamic range of linear response to pure tones) is indicative of inner ear pathology in clinically diagnosed abnormal ears. 2) There seems to be a strong interrelationship between the presence of loudness recruitment and a low threshold of distortion.

129 pages. \$1.61. MicA 55-2248

## ZOOLOGY

### THE TENEBRIONIDAE OF THE PACIFIC NORTHWEST (COLEOPTERA)

(Publication No. 12,976)

Dennis Warren Boddy, Ph.D.  
University of Washington, 1955

The thesis is a taxonomic study of the coleopterous family Tenebrionidae in British Columbia, Washington, Idaho, and Oregon. Approximately 20,000 adult beetles from the major public and private collections in the Pacific Northwest as well as from the California Academy of Science were studied. Identifications were made from published descriptions and comparison with previously identified specimens, particularly those in the F. E. Blaisdell collection at the California Academy of Science. Comparisons with type specimens were possible only for those described by Blaisdell.

The species are analyzed in the form of a descriptive key. The key also includes the Northwestern distribution, a bibliography of the previously published Northwestern records with synonymy, and such information on habitat and ecology as is available. While new characters for the separation of Northwestern species have been introduced in many cases, the most profound changes in classification have been made in the species of *Coniontis*, and the species of the subgenera *Litheleodes* and *Blapyllis* in *Eleodes*, these three groups including about one-fourth of the total Northwestern species. In the subgenus *Blapyllis* of *Eleodes*, the male copulatory apparatus has been used on a more extensive scale than previously to distinguish some of the species. This has resulted in some new opinions on the specific status of previously recognized forms.

The key includes descriptions of 125 species. It also includes 7 subspecies in addition to typical forms. Of these, 9 species and 3 subspecies are considered new. In addition to the 125 species in the key, 4 more species are described from the literature and considered as Northwestern species. A few additional species are discussed, but are considered doubtful as to their occurrence in the area, or probably synonymous with other recognized Northwestern forms. Of the 129 Northwestern species, 42 or nearly one-third are here recorded from the region for the first time.

A number of changes in tribal and subfamily arrangements have been suggested. The structure of the mentum has been considered significant in arriving at the higher category limits.

The key is followed by an annotated list which gives specific locality data as well as a discussion of taxonomic and nomenclatorial problems for some of the species.

277 pages. \$3.46. MicA 55-2249

### THE PROVENTRICULUS OF IMMATURE ANISOPTERA (ODONATA) WITH REFERENCE TO ITS USE IN TAXONOMY

(Publication No. 12,521)

Alice Howard Ferguson, Ph.D.  
Louisiana State University, 1955

Supervisor: Professor J. H. Roberts

The morphology of the proventriculus of forty-one species of thirty-five genera of immature Anisoptera was investigated. It was found that in some genera the proventriculus is useful in taxonomy but among other genera there is too much uniformity.

The genera *Progomphus*, *Gomphoides*, *Aphylla*, *Hagenius*, and *Dromogomphus* of the Gomphidae may be recognized by the structure of their proventricular plates. Of the Aeshnidae *Boyeria*, *Aeshna*, and *Basiaeschna* can be characterized by their proventricular plates. *Epiaeschna* and *Coryphaeschna* have plates that are approximately alike, but differ from those of other genera studied. There is a greater difference between the plates of *Anax junius* and *Anax amazili* than among the several other genera of Aeshnidae studied. *Anax junius* and *Anax amazili* can be distinguished from other Aeshnidae by the structure of their proventricular plates.

The Macromiinae are unique among the Libellulidae studied. The genera *Didymops* and *Macromia* cannot be distinguished from each other by the structure of their armature.

The proventricular plates of the genera of Corduliinae and Libellulinae are much alike; thus, are of limited use in taxonomy.

The phylogenetic relations of the families of the Anisoptera and of the genera studied based chiefly on the structure of the proventricular armature are discussed, and phylogenetic trees of the Gomphid and Aeshnid genera are presented. A key to the nymphs studied based on the structure of the proventricular plates is included.

No correlation was observed between the number of either spines or teeth and the size of the nymph.

198 pages. \$2.48. MicA 55-2250

### SPECIATION OF THE WANDERING SHREW

(Publication No. 12,865)

James S. Findley, Ph.D.  
University of Kansas, 1955

Four species of western North American shrews, *Sorex pacificus*, *S. yaquinae*, *S. obscurus*, and *S. vagrans*, have been placed in the so-called *Sorex vagrans-obscurus* species group as an indication of their close relationship.



Study of the distribution and variation of these four kinds reveals that *S. pacificus* intergrades with *S. yaquinae*, *S. yaquinae* intergrades with *S. obscurus*, and the latter kind intergrades with *S. vagrans*. The range of *S. vagrans* then overlaps that of *S. pacificus*, *S. yaquinae*, and part of the range of *S. obscurus*. Thus, while intergradation between the four kinds shows them to be subspecies of one continuously interbreeding species, the terminal members of the chain of subspecies are so differentiated from one another that where their ranges overlap they are reproductively and to a certain extent ecologically isolated. *Sorex vagrans* Baird, 1857, is the oldest name applicable to this shrew.

A possible mode of origin of this circle of subspecies is suggested as follows: (1) During Illinoian glaciation ancestral *Sorex vagrans* had an extensive and continuous distribution in western North America south of the continental ice sheet; (2) during the ensuing Sangamonian interglacial interval increased temperature and aridity restricted the range of the species to montane and northern regions in such a manner that the range resembled an inverted U, one arm lying along the Rocky Mountain axis, one along the Cascade, Coast, and Sierra Nevada chains, and with the top across central or northern British Columbia; (3) the advent of Wisconsinian glaciation effected (a) the disjunction of the eastern and western arms of the U, and (b) southward, westward, and possibly eastward movement of the Rocky Mountain segment in response to depression of the life-zones and development of extensive lacustrine and riparian conditions in the Great Basin; (4) post-Wisconsinian deglaciation and desiccation led to (a) northward and westward spread of the Rocky Mountain population bringing it into secondary contact with the Pacific Coastal population with which intergradation took place; (b) westward, northward and eastward spread of the Great Basin stock bringing it into secondary contact with the now reproductively isolated west coast population and with the northern and eastern montane populations with which the Great Basin population variously intergraded or coexisted, and, finally, (c) segmentation of the southern range of the species resulting in its restriction to isolated mountain masses in such places as Arizona, New Mexico and Mexico.

Review of all the species of North American *Sorex* leads to the conclusion that they fall naturally into two subgenera rather than three as was previously supposed. These two subgenera, *Sorex* and *Otisorex*, are differentiated chiefly by characters of the teeth, and lower jaws. Phylogenetic relationships and evolutionary history of the subgenus *Otisorex* are discussed. It is postulated that rate of speciation in this group, and probably in most boreal mammals, is most rapid during interglacial intervals because of segmentation of boreal habitat in those times.

Twenty-nine subspecies of *Sorex vagrans* are recognized. These subspecies differ from one another chiefly in size and color.

110 pages. \$1.38. MicA 55-2251

#### RATE OF GLUCOSE CONSUMPTION BY MALARIAL BLOOD (*Plasmodium hexamerium*)

(Publication No. 12,691)

Parviz Ali Khabir, Ph.D.  
Syracuse University, 1955

The primary problem was the study of the rate of glucose consumption by *Plasmodium hexamerium*. This species produces infections in ducklings characterized by a high parasitemia, usually reaching 50 per cent or more. Multiple infections of erythrocytes and the increase in the average number of merozoites from six to eight per segmenter were found to be characteristics of this malarial species in ducks. Despite the frequently high parasitemia, *Plasmodium hexamerium* does not cause a severe anemia, the average fall in the red cell count being only about 0.576 million/mm<sup>3</sup>.

In order to produce severe reticulocytosis in ducks, so that the glucose consumption of reticulocytes could be determined, oral administration of phenylhydrazine hydrochloride was employed. The minimum effective dose was found to be 8.05 mgm. of drug per 100 gm. of body weight when given three doses, one each day.

In normal ducklings phenylhydrazine caused a sharp fall in the red blood cell count, with resulting reticulocytosis, but a return to normal followed in about 3 days. Study of the behavior of *Plasmodium hexamerium* in phenylhydrazine-treated ducks showed that this drug may bring about an increase or decrease in parasitemia of the *P. hexamerium*, depending on whether the inoculation of parasites was made after the treatment period or concurrently. It was also observed that this species of parasite has a strong preference for mature or older red blood cells.

It was found that the average ring stage of *Plasmodium hexamerium* has a total surface area of 4.4 square micra, the average trophozoite and schizont 20.4 square micra, and the average segmenter and gametocyte 40.4 and 33.8 square micra respectively.

Repeated glucose determinations (using the modified Folin-Malmros method) were made from samples kept in glass tubes, originally designed for use with the Harvard culture technique, at intervals of fifteen minutes over a period of three hours, during which time the tubes were kept in a warm room (40°C) and treated as in the Harvard process.

A small difference was noted in the *in vivo* glucose level of the blood of healthy, anemic, and *hexamerium*-infected ducklings, the mean for each being 147 mg. %, 185 mg. % and 170 mg. % respectively.

From study of the glucose consumption of blood from normal, anemic, and *Plasmodium hexamerium*-infected ducklings the following mean values were obtained:  $7.58 \times 10^{-2}$  mg. glucose per  $10^9$  mature erythrocytes per hour;  $3.66 \times 10^{-1}$  mg. glucose per  $10^9$  reticulocytes per hour; and  $1.42 \times 10^{-4}$  mg. glucose per  $10^7$  square micra parasite area per hour. Qualitatively the results indicate gross differences in the consumption of glucose by adult red blood cells, reticulocytes, and parasites. Thus the average mature red cell has a metabolic rate only about one-fifth that of a reticulocytes, and an "average" parasite (one having a surface area of 24.8 square micra) consumed  $35.3 \times 10^{-11}$  mg. glucose per hour, or about five times as much as an adult red cell.

An empirically derived formula is given, based on

experimentally obtained data, for predicting the hourly glucose consumption rate ( $W_t$ ) of a given quantity of parasitized blood (*Plasmodium hexamerium*):  $W_t = 7.58E \times 10^{-2} (A + 4.828R + 7.493P \times 10^{-5} (a + 5b + 10c + 8.5d))$  in which the symbols are those listed in Table XVI. The deviation between the mean calculated from the experimental results and the mean calculated by using the formula was found to be statistically not significant according to Student's "t" test, as P was greater than 70 per cent.

121 pages. \$1.51. MicA 55-2252

**BIOLOGY OF THE RED SALMON,  
ONCORHYNCHUS NERKA (WALBAUM) OF  
BRISTOL BAY, ALASKA, AS REVEALED BY  
A STUDY OF THEIR SCALES**

(Publication No. 12,993)

Ted Swei-yen Koo, Ph.D.  
University of Washington, 1955

This work deals mainly with the scale studies of the red salmon, *Oncorhynchus nerka* (Walbaum), of Bristol Bay, Alaska. The salt-water growth in the adult scales was studied first. A graphical method was devised in which all scale axes were equated to 100 percent and the average width of circuli in each 5-percent interval was calculated. These averages were then plotted, showing the minimal values which represented the annuli. For any particular size group, a number of scales were summed by each successive interval to secure mean values for each 5-percent interval. Such mean scale graphs were obtained for the scales of the various size classes it was desired to compare as to age. It was shown that two different age groups were responsible for the two major size groups of fish that are characteristic for the Bristol Bay red salmon. The smaller possessed two annuli in the salt-water growth, the larger, three. This was true for both sexes of fish, for all the districts in Bristol Bay, and in all years studied.

By this method, personal interpretation of scale marks was avoided and doubts as to the age significance of the marks determined were removed. It was possible to use size as a criterion of number of years of sea life in the spawning fish, whose scales were eroded at the margin. Since the parts of the scales of fresh-water origin are legible, there was thus furnished a basis for accurate age analysis of the escapement, hence of the total run. This was basic to any scientific study.

The fresh-water growth of the scales was studied in two parts.

First, the growth pattern and age significance of young-fish scales during their fresh-water life were studied by the same method. Samples of young red salmon collected in 1949 from the Wood River system were grouped by semi-monthly periods. Two age classes of fingerlings were present as 2nd- and 3rd-year fish, the former largely predominating. The increase in size as the season advanced was accompanied by addition of growth to the edge of the scales. Circuli at the edge were narrowest in early June and widest in early August. Only one narrow band of circuli, i.e., the annulus, was formed within the year, and this occurred between October and June.

Second, the nuclear area of adult scales from spawning grounds in the Wood River system was studied. Scales from the adults returning in 1951 with two ocean annuli and those in 1952 with three ocean annuli were included, for comparison with the 1949 smolts, since they all originated from the same spawning. Since scale curves for the successive years were similar in each district and since distinctive curves were found for different districts, it is evident that the spawners had returned each to the district in which it had been born. When the scale curves for the nuclear areas of these adult scales were compared with those for the entire scales of the 1949 smolts, intermediary growth between fresh-water and salt-water growth did not appear in such amount as to confuse age determination.

A synopsis of the scale characteristics of the five species of Pacific salmon of both young and adult stages and a key to the identification of adults by means of scale examination is presented.

181 pages. \$2.26. MicA 55-2253

**THE ROUGH-WINGED SWALLOW: A  
COMPARATIVE STUDY BASED ON ITS  
BREEDING BIOLOGY IN SOUTHERN MICHIGAN**

(Publication No. 12,612)

William Allan Lunk, Ph.D.  
University of Michigan, 1955

This is a study of *Stelgidopteryx ruficollis serripennis*, the form of Rough-winged Swallow which breeds over most of the continental area of the United States. The aim was to learn as much as possible of its little-known breeding biology, and to make such comparisons with published data on other swallows as might bear upon its position within the cosmopolitan Family Hirundinidae. Field work was done in Washtenaw County, Michigan, during the summers of 1949 to 1952. Information was secured from approximately 97 nestings, over half of them in artificial nest-containers (especially devised for this study), which permitted frequent examination of the nest contents with minimum disturbance of the nesting birds.

Contributions incidental to the work pertain to general behavior, variations in notes, and means of distinguishing the sexes in life. The diversity of nesting sites was investigated, and ready-made holes in banks or cliffs shown to be most generally used; the lack of conclusive evidence of hole-excavating by these swallows was emphasized. Some delayed nestings observed were attributed to a shortage of sites. Male and female apparently select their nest-site independently, and by mutual tolerance there establish a pairing bond. Pursuit flights (involving the male's display of white under tail coverts) are participated in by both sexes, and probably have both sexual and territorial significance. Only the nest-site itself is defended. Nest-building is almost exclusively by the female, the male, however, being regularly in attendance.

The average clutch size was about 6.25 eggs, perhaps the highest recorded for any swallow. Eggs are laid soon after sunrise, usually (but not invariably) on successive mornings. No second broods are raised, but early in the season renesting generally follows loss of nests before the hatching of the eggs. Incubation is entirely by the female,



the male frequenting a nearby perch and accompanying her on flights to and from the nest. Incubation rhythms are essentially like those of other swallows. The incubation period (almost exactly 16 days) varies little for last-laid eggs, and the hatching times of all eggs could be explained by differences in the early stages of incubation. The young are brooded by the female for a few days. Rough-winged Swallows, except laying, incubating, or brooding females, roost (collectively) at points distant from the nests. Both sexes feed the young. Nestlings reach a weight well above the adult average, then lose weight before leaving the nest (at an age of about 19 to 20 days). Growth of bony elements and soft parts requires about ten days; that of the plumage continues beyond the nestling period. Young of small broods appear to gain weight more rapidly than do those in large broods; the youngest members of broods suffer no more than a temporary handicap. Immediately after the young depart, most of the swallows leave the breeding area and begin their migration.

The timing of the nesting season varies from year to year, partly in response to weather conditions. The overall reproductive efficiency was about 61 per cent, and survival-rates of nestlings very high. Mortality factors were analyzed, and a weasel (*Mustela frenata*) found to be the most important predator, taking adults, young, and eggs. Relationships with other species of birds, and with other animals, were discussed.

Although the Rough-winged Swallow is gregarious, it is not essentially colonial. It appears well adapted to conditions in the northern part of its range. The function suggested here for the serrations on the outer primary is the production of a sound, possibly of importance in courtship flights. The Rough-winged Swallow is strongly differentiated from other swallows, in behavior as in morphology, and probably is of Neotropical origin. The use of artificial nesting containers might maintain this desirable bird in numbers close to civilization.

417 pages. \$5.21. MicA 55-2254

**SILVER SALMON, *Oncorhynchus kisutch*,  
SURVIVAL STUDIES AT  
MINTER CREEK, WASHINGTON**

(Publication No. 13,002)

Ernest Olavi Salo, Ph.D.  
University of Washington, 1955

The objective of the thesis is to present the basic upstream and downstream migration data and survival rates of artificially and naturally propagated silver salmon, *Oncorhynchus kisutch*, at Minter Creek, Washington. The studies were conducted at the Minter Creek Biological Station which was established in 1937 by the State of Washington Department of Fisheries. A permanent weir with screening and trapping devices was designed and installed to enable the enumeration of both upstream adult migrants and downstream fry migrants. The different experimental lots of fish were identified by the removal of particular fins.

The numbers of upstream migrants from 1937 to 1954 are listed. The natural run of adults in the stream varies

between 2,000 and 2,500 fish. The principal downstream migration of seaward-migrant yearlings is in the month of May and the majority of the migrants are one year of age. The numbers of fish involved in the annual migrations are discussed for the years 1938 to 1954.

Fish reared in the hatchery to the age of three months, showed fresh-water survival rates of less than 11 per cent and salt-water survival rates from 4 per cent to 10 per cent. Additional rearing to six months of age increased the fresh-water survival to 21 per cent; however, the marine survival rate was only 3.0 per cent. Fish reared for eight and nine months had an average fresh-water survival of 40 per cent, while plantings of yearlings showed a fresh-water survival of 70 per cent; however, the salt-water return of these latter groups ranged from 0.07 per cent to 2.88 per cent. Thus, an inverse correlation between fresh-water and salt-water survival rates was obtained.

A total survival of 0.70 per cent (hatchery mortality included) can be expected for marked Minter Creek hatchery fish which are reared for eleven to twelve months. Thus, each female spawned artificially would result in a return to the stream of 18 adults, in addition to a contribution of 52 fish to the fishery.

Counts of naturally-spawned yearlings revealed apparent limits to the rearing capacity of the stream. Escapements of 1,000 females produced from 18 to 37 yearlings per female (fresh-water survival from 0.70 to 1.42 per cent). An increase in the number of yearlings produced per female was evident in the 500-female and 100-female escapements with the production rising to approximately 65 yearlings and 185 yearlings per female, respectively.

The marine survival rates for naturally spawned fish could be accurately determined for five separate years. The marine survival rates were inversely correlated with fresh-water survival rates and former rates varied from about 1.7 per cent to 6 per cent.

Comparison of returns of adult fish produced by natural propagation with those produced by artificial propagation, for relatively small numbers of spawners, indicates that artificial propagation is more efficient provided long-term (six to twelve months) rearing is practiced. When 800 females are placed above the weir for natural spawning, 1400 to 1800 adults may be expected to return. In contrast, if 800 females spawned artificially and the yearlings produced are released into Minter Creek, approximately 5,000 adults may be expected.

199 pages. \$2.49. MicA 55-2255

**SOME ASPECTS OF THE BIOLOGY OF  
*SPHAERIUM (MUSCULIUM) PARTUMEUM* (SAY)**

(Publication No. 12,655)

Grace Jean Thomas, Ph.D.  
University of Michigan, 1955

The growth, reproduction, and life history of *Sphaerium (Musculium) partumeum* (Say) were studied both in the laboratory and in the natural habitat, which was a temporary pond. Growth in this species is indeterminate, but almost full size is attained in the first fourteen weeks. In both pond and laboratory populations growth began slowly, accelerated rapidly, slowed suddenly, and then continued at

a steady rate until the death of the animal. The specimens in the field, however, attained a slightly greater terminal size. Until the fifteenth week the ratio of length to height was noticeably greater in field specimens than in laboratory animals.

Sphaeriids were raised in the laboratory in finger bowls containing aerated tap water which was saturated with a calcium salt. Food was provided by the addition of strained beef liver and strained spinach, which may have been used directly by the clams, or may have supported bacteria which served as food. Some of the cultures were supplied with air bubbled from a capillary tube, but the animals in them were in no way as successful as those in unaerated dishes. The specimens were placed in separate culture dishes immediately after birth, and were measured in length and height at weekly intervals.

Specimens of *Sphaerium partumeum* successfully reproduced by self-fertilization through six generations in the laboratory. The retention of vitality of the stock through that number of generations seems to indicate that self-fertilization occurs in nature as well as in the laboratory in this species. Offspring were produced by specimens as small as 3.7 mm in length, and the young at birth varied among themselves as much as 0.92 mm, depending upon how long they had remained in the inner branchial chamber. Most of the laboratory animals began to produce young between the tenth and thirteenth weeks of growth, but a few individuals bore offspring as early as the seventh week. From that time on the young were produced at irregular intervals until the death of the parent. Field young, on the other hand were retained within the parent until after the thirteenth week, and consequently they were larger than most of the laboratory-born young.

For the life history study, samples of a field population were taken at monthly intervals during 1953 and parts of 1954 and 1955. The habitat studied was a temporary pond near Ann Arbor, Michigan. The pond contained no standing water during the winters of the first two years, but was filled from October 1954 until the end of the study. Analysis of 24 monthly samples showed that the clams live 13 or 14 months, and that their pattern of growth is regulated by the presence or absence of standing water in that habitat. Animals born in June and July aestivate during the dry months, and begin to grow when water fills the pond again. Low temperatures in winter cause a cessation of growth, which is resumed as the water becomes warmer. The young of the year are produced in June and July, and they maintain the population over the dry months. There is, therefore, a single generation per year.

78 pages. \$1.00. MicA 55-2256

#### THE NATURE OF TREPPE

(Publication No. 12,658)

Janet Lowe Anderson Twente, Ph.D.  
University of Michigan, 1955

It has been observed that in a non-beating auricle of the turtle heart, stimulated at a suitable frequency, the contractions gradually increase in height forming a Treppe or staircase. The cause of Treppe has been generally regarded as being dependent on the production of some

favorable condition on stimulation which disappears sufficiently slowly to allow it to augment the development of tension at the following contraction.

The basic problems are still the cause and nature of this "favorable state." It is induced by stimulation, possibly as a result of cellular processes initiated at that time. It develops during the contraction cycle and persists into the period between contractions. The rates of onset and decay of the "favorable state" are influenced by numerous agents. The only sign of its existence is the increase in the size of the contraction and a concomitant change in the amount of cellular potassium.

The critical problems requiring investigation are: 1) the time in the contraction cycle at which the conditions causing the "favorable state" occur, 2) the kinetics of the "favorable state" as indicated by its rate of development and decay, and 3) the way the "favorable state" influences the development of tension as revealed by changes in the form of the myogram under conditions of full Treppe as compared to the myogram of a rested muscle. In this study these problems were pursued in relation to the effects of stimulation rate, type of stimulation, temperature, pressure, calcium, and potassium.

It was found that stimulation, pressure, and calcium all augment the development of full Treppe and all reduce the time of the latent period and increase the initial rate of contraction. The action of pressure was limited to the initial 1/10 of the contraction phase, the time during which the activator cycle is operating. The decay or disappearance of the "favorable state" is regarded as being governed by the rate of the metabolic recovery cycle following contraction. The "favorable state" is considered as being caused by 1) the accumulation of some metabolite during the metabolic recovery cycle, or 2) a portion of the energy released during the metabolic recovery cycle being used to increase the level of the activator cycle.

Treppe is considered to be affected by agents acting on the activator cycle increasing either the amount of activator or its affinity for actomyosin. An increase in temperature, pressure, calcium, or "favorable state" all facilitate this reaction resulting in the production of more contractile actomyosin.

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#### STUDIES ON THE CYTOCHROME SYSTEM DURING THE DEVELOPMENT OF THE EMBRYO OF THE GRASSHOPPER, *MELANOPLUS DIFFERENTIALIS*

(Publication No. 12,931)

William Lionel West, Ph.D.  
State University of Iowa, 1955

Chairman: Assistant Professor: William B. Cosgrove

Title: Studies on the cytochrome system during the development of the embryo of the grasshopper, *Melanoplus differentialis*.

In an attempt to account for the fall in oxygen consumption in the grasshopper embryo the presence of the following components of the cytochrome oxidase pathway have been demonstrated during diapause; cytochrome c oxidase,



succinate-sytochrome c reductase, DPNH-cytochrome c reductase, and cytochrome bands for the cytochrome b group (553-565 m $\mu$ .), cytochrome c (549 m $\mu$ .), and cytochrome a + a<sub>3</sub> (598 m $\mu$ .).

The evidence presented suggests that there is a cytochrome system present during diapause. These results suggest that the lack of available substrate, probably succinate or its precursors, is related to the lowered respiration.

46 pages. \$1.00. MicA 55-2258

#### DETERMINATION OF AGE FROM THE SCALES OF NORTHERN PIKE (*ESOX LUCIUS* L.)

(Publication No. 12,668)

John Edward Williams, Ph.D.  
University of Michigan, 1955

The ability to determine the age of fish is a necessary tool for the accumulation of scientific facts which will contribute to more intelligent management of this renewable resource. The northern pike, an important game and food fish (as well as a valuable predator), has been considered very difficult to assess as to age from its scales in Michigan. This study set out to determine if and how pike scales could lend themselves to age determination.

Scales were examined for growth characteristics during known intervals from individuals of partly known age (tagged fish which were recaptured after a known interval and increase in size) and those of known age. During the investigation 644 wild fish were tagged in Sugarloaf Lake, Washtenaw County and in Orchard and Ocqueoc lakes, Presque Isle County, of which 142 (22.0 percent) were recaptured after an average of 170 (range, 1-619) days. Fish were tagged either with a monelmetal strap on the opercle or lower jaw or with a plastic streamer attached to the back with a nylon thread.

The annuli of pike scales were found to differ strikingly according to age. The first annulus was most often characterized by a zone (chainlike in appearance) of extremely

irregular, discontinuous circuli. This peculiar formation, which often formed before spawning, was possibly associated with regeneration of the scale margin. The typical second annulus was composed of two or three irregular circuli forming a break in the scale pattern. Later annuli were of several types, most common of which were those indicated by a hyaline mark or by irregular circuli. Nearly all annuli were prominent at the posterior field as a hyaline band, devoid of circuli.

Pike of age-groups I and II often formed their annuli before spawning but older fish usually evidenced it a month or more later. Annuli were laid down between early March and June 1 in the southernmost part of the state and between late March and late June in more northern locations.

Two- and three-year-old pike completed approximately 50 percent of their yearly scale growth by July 1, 75 percent by August 1 and nearly 100 percent by October. The fish apparently grew proportionately more in body length than in scale length over winter.

Occasionally an abrupt increase in growth rate early in the first year, probably associated with a change from insect to fish diet, caused an annulus-like pattern on the scales. A common and often prominent false annulus, which has apparently been responsible for much of the difficulty encountered in aging pike, was indicated as a hyaline mark on the scales of many yearling or older known-age and wild individuals. This check, formed in July and August, is believed to be caused by growth cessation due to reduced feeding during periods of above-optimum water temperatures. Because fall growth, after the false annulus, is mostly deposited at the anterior portion of the scale, there usually are more than twice as many circuli anterolaterally as posterolaterally outside the false check; growth after a true annulus is more nearly equal in the two fields. The tendency, therefore, is for the summer check to approach or combine with the following true annulus toward the posterior region.

Tags located on the mandible reduced the growth rate by more than 50 percent and reduced the condition so drastically that many individuals so involved did not form annuli. All pike, except those adversely affected by jaw tags, formed a recognizable year mark each year, proving the validity of the annulus for age determination.

195 pages. \$2.44. MicA 55-2259

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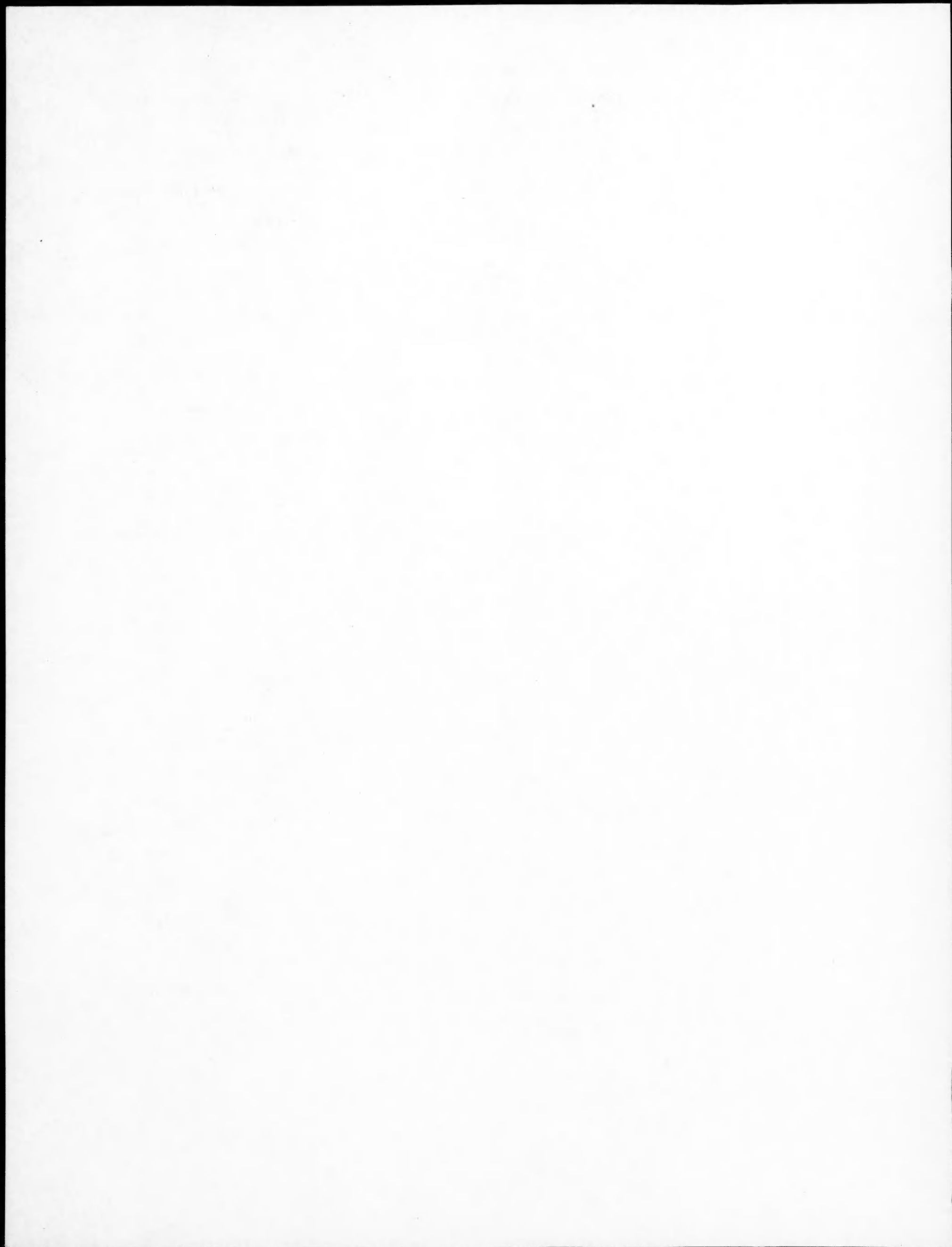
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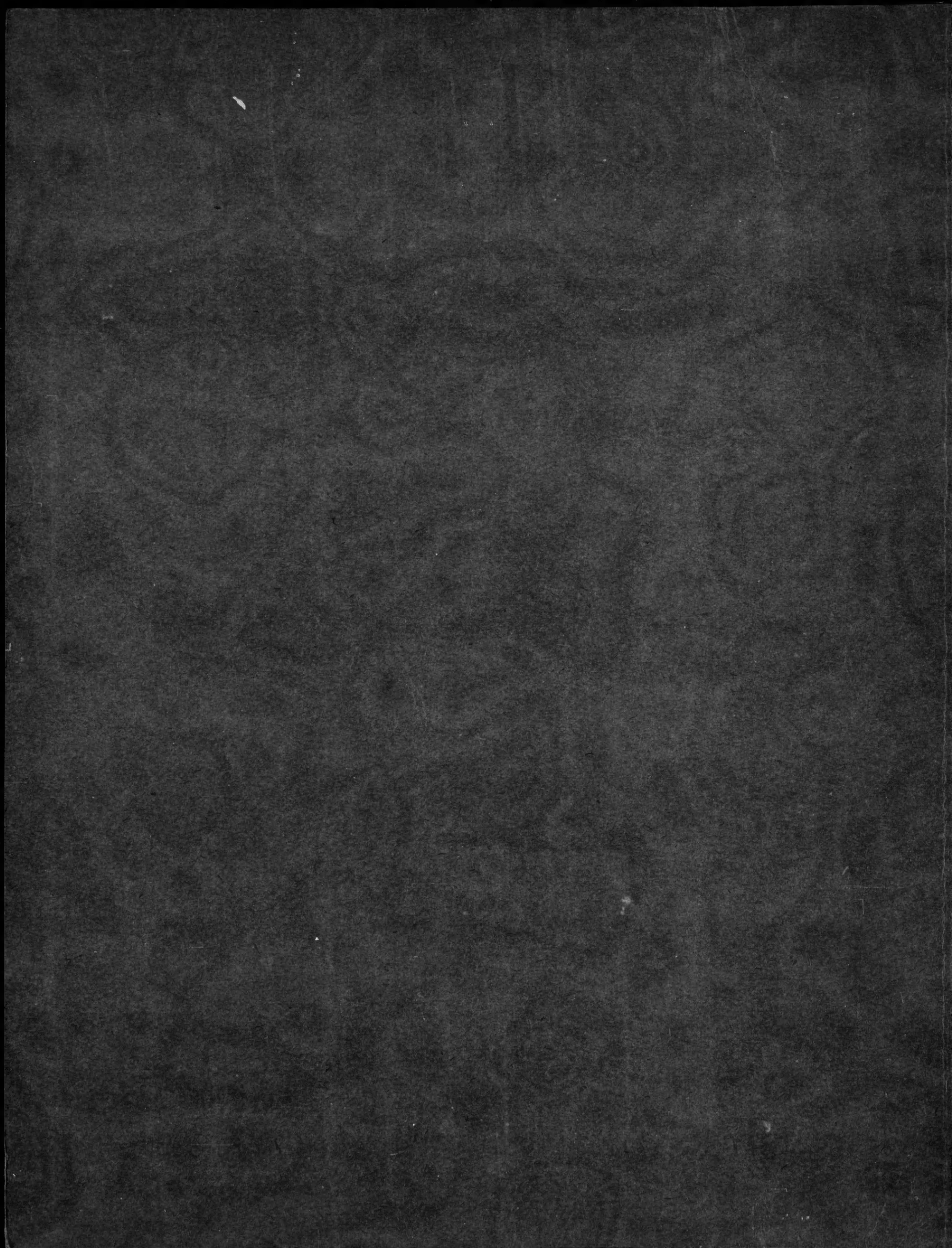
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